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SCUBAPRO

Chris Newbert and the Canon F-1

Of all hostile environments, the sea is perhaps the most forbidding. Both camera and photographer must go under with everything they need for survival. But aside from safety considerations, the special requirements of marine photography put a great burden on any camera.

Chris Newbert's specialty is the photography of underwater marine life, and for this he chose the F-1 as his exclusive system.

"Mechanically," he says, "the F-1 is the epitome of equipment designed for use underwater, with a ruggedness and smoothness of operation that's essential for this type of work. My first F-1 was completely flooded with salt water. This almost certainly destroys a camera completely within a short time. After a thorough rinsing in fresh water and subsequent drying out, it functioned for months until the housing manufacturer replaced it —a very rare and nearly impossible performance!"

Chris leans heavily towards the Canon Super Wide Angle lenses for startlingly dramatic close-ups and towards the Canon Macro lenses (FD 50mm f3.5 SSC Macro and FD 100mm f4 SC Macro) for their exceptional flexibility in focusing range underwater, where changing lenses is out of the question.

For the photograph of the jellyfish reproduced here, Chris used the FD 50mm f3.5 SSC Macro with electronic flash for fill. "The incredibly sharp Canon Macro lenses are invaluable under water, where I can photograph a 1" long sea slug at one moment and a 12' manta ray at the next with a simple twist of the focusing ring. But of course, the most innovative thing about the F-1 is that you can use the Speed Finder in an underwater housing and *still* make full use of the camera's built-in metering system. It's *great*."

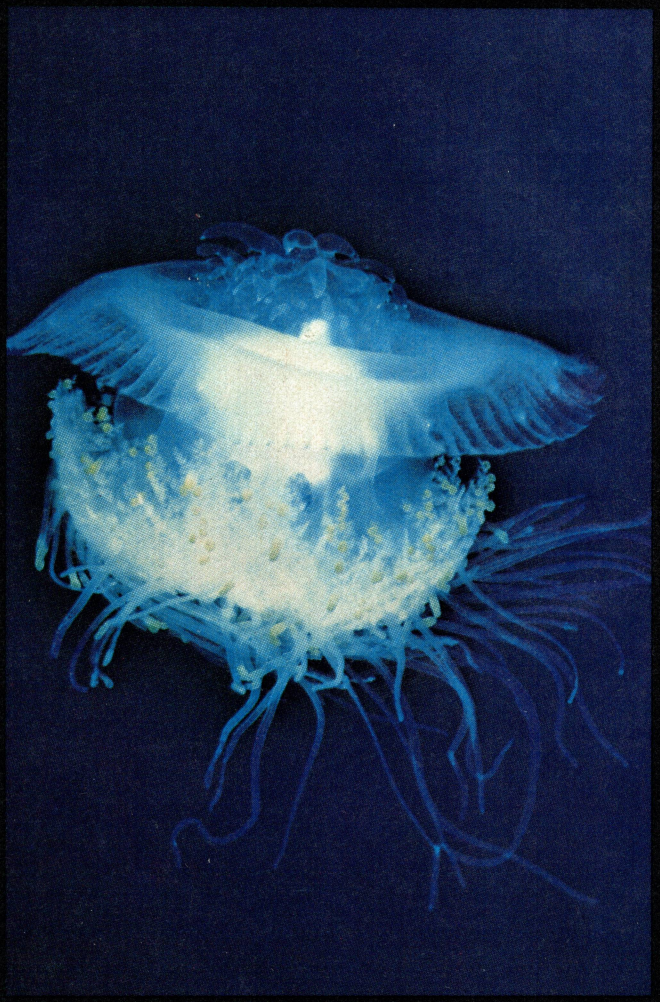

Photo taken with Canon F-1 and FD 50mm f3.5 SSC Macro lens. 1/60 sec. at f11. ASA 25.

"The F-1 helps me bring marine life to life"

The Canon F-1 system has fast become the system of choice for underwater photographers because of its handling and especially because of its unique Speed Finder, that not only permits metering but (above the surface) rotates 180° for eye- or chest-level viewing. It's the perfect accessory for underwater use, aerial photography or any photography where the eye can't come into direct contact with the Standard Finder. It's one of the five available interchangeable viewfinders for the F-1, each with a uniquely Canon approach to system quality and all but one using the F-1's built-in metering system.

Newbert's home base is on the island of Hawaii, from which he travels frequently for marine assignments all over the Pacific. His work has been published widely and exhibited in numerous photographic galleries, as well as being in demand by clients in need of superior color photography of underwater fauna.

Like many photographers, Chris Newbert has found that only the Canon F-1 system could fulfill his specific needs. If you're in the market for an SLR system that's built for *your* needs, you're in the market for the F-1 system.

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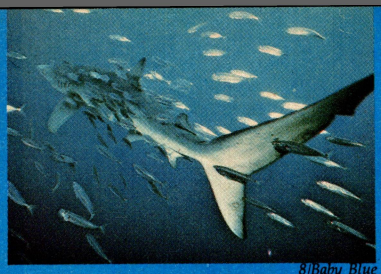

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COVER

Ken Cooper, of the Santa Monica Blue Fins Dive Club, flies the divers flag during a Southern California beach dive. For all you've ever wanted to know about dive flags, see page 20. Photograph by Geri Murphy.

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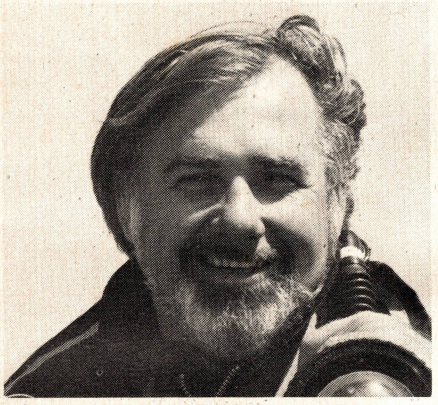
SDM Editorial

BY THE PUBLISHER



Check List for Spring

With spring just around the corner, it's time to think about dragging out that dive gear from your closet and dusting it off for the new season. Chances are, you have not looked at it since it was washed and stored away after last year's diving. There is also a good possibility that some of your dive gear is in need of maintenance, repair or parts replacement.

Dive equipment, particularly the rubber parts, deteriorates with age, regardless of whether it is being used underwater or stored in a closet. The important thing is to inspect your equipment *now*, before the dive season begins. Give yourself plenty of time to complete the necessary maintenance and shop for replacement parts.

In going over your gear, make a careful inspection of the little things — those insignificant items which are often overlooked or just taken for granted. Here is a handy guide for checking out your gear piece-by-piece. By following this simple check list, you may discover a few potential equipment failures and thus avoid a good deal of aggravation on the dive boat or underwater:

Mask—Check the headstrap for signs of cracking or splitting, especially around the buckle area. If it looks suspicious, replace the strap with a new one and buy another for an emergency spare. Treat both straps with Armor All.

Snorkel—Check the tab for cracking or tears. Replace if necessary and obtain another tab as a spare. Make sure the mouthpiece section is solidly glued to the snorkel tube. Also check the mouthpiece bit for tears or cracking.

Fins—Check the heel straps for cracking or crazing, especially in the buckle area. Replace straps if they look suspicious. Treat all heel straps with Armor All protective coating. Also check the fin blades for signs of splitting.

Wetsuit—First check all zippers to make sure they are moving freely, and lubricate thoroughly with Zipper-Ease or silicone spray. Next, check the seams for signs of splitting, especially in the armpit and crotch area. Chances are your old can of neoprene cement has hardened like a rock, and you'll have to purchase a fresh can of cement for making necessary repairs. If your suit has sewn seams, check for unraveling threads, and have these seams resewn or reglued.

Weightbelt—Make sure you have sufficient lead for maintaining neutral buoyancy at 10 feet. Check the buckle to ensure that it is functioning properly and not slipping. You may also want to consider adding a belt snap onto your weightbelt for easy attachment of a dive light, goodie bag or other accessories.

Buoyancy Compensator—Inspect the low pressure air inflator to ensure smooth operation. Lubricate all moving metal parts with silicone. Fully inflate the compensator to check for air leaks. Flush the inside of the air bladder with a chemical cleaner to remove or kill any bacteria. If the compensator is equipped with a CO_2 inflator, check and lubricate the inflator mechanism and inspect the cartridge. Also make sure you have a spare cartridge.

Dive Knife—Check the blade for rust spots, and remove with WD-40 spray. Lubricate the blade with a heavy coating of protective silicone grease. Check the retainer ring on the knife scabbard for splitting or cracking. Also check the scabbard straps for cracking or splitting. Replace whatever parts necessary.

Regulator—Attach it to a tank full of air to make sure it is working properly. If you suspect the regulator is breathing hard, have it cleaned and tuned by your local dive shop. Also inspect the sintered filter for signs of corrosion or rust, and take it in for repair if you see any suspicious discoloration. Make sure the exhaust valve is not stuck shut by exhaling into the mouthpiece.

Octopus Unit—Your octopus second stage should breathe as easily and as smoothly as your primary unit. If not, have it cleaned. Also check the attachment strap or clip for the octopus to make sure it is not frozen with corrosion.

Submersible Pressure Gauge—Check the dial face for signs of water leakage or interior corrosion. Attach a regulator to the tank and turn on the air while watching the gauge. The needle indicator should move smoothly as the air pressure increases. Also, make sure your pressure gauge is reading accurately by comparing it with either another SPG or a hand pressure gauge. Check the hose fittings at both ends for signs of air leakage.

Tank—Have the interior of your tank visually inspected for rust or internal corrosion. This should be done regularly — once a year. Check your tank valve for signs of corrosion and make sure the valve turns on and off smoothly and easily. If it is hard to turn, no doubt it is in need of a thorough cleaning and lubrication by your dive shop repair man. Remove your tank boot and check for signs of external corrosion where the boot has trapped water. Remove the O-ring from the tank valve and replace with a new one if it looks at all worn.

Tank Pack—Check the pack for signs of cracking or corrosion, and inspect the tank band for signs of wear. Make sure the band is snugly bolted to the pack and the tank cannot wobble or slip when it is attached to the pack. Check all harness buckles for signs of wear or slippage. Be sure there are no parts missing from the harness assembly.

Dive Light—If it is the dry cell type, disassemble and replace the batteries with fresh ones. If it is a rechargeable, the battery should be recharged once every 30 days, even while in storage. Make sure you have a spare bulb for extended dive trips. Check your dive light lanyard to ensure that it is in good shape and securely fastened to the light.

In addition to making a general equipment inspection prior to the diving season, you should go through the same procedure at least two days prior to every dive trip. You'll be amazed to find yourself experiencing far less dive gear failures throughout the season. And, you'll feel much more confident knowing your gear is in perfect working order.

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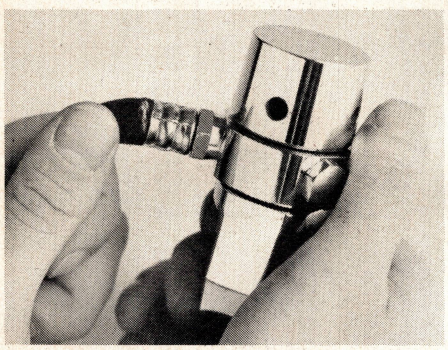

CHECK HOSE FITTINGS BEFORE EVERY DIVE.

Wear and tear on hoses, especially at the point where the hose meets the metal fitting, can end a great day of diving fast.

There are a number of elements working against your hoses, even when you're not in the water. Elements that can cause deterioration and ultimately lead to leaks and ruptures.

Ruptures occur most often because a diver has put unnecessary and constant stress on a hose at the fitting. Rolling or coiling your regulator and hose to fit a dive bag, for example, can easily bend the hose against the fitting and cause crimping. The weight of a second stage, or a power inflator can also cause the hose to bend unnaturally and weaken.

Fortunately this potentially dangerous problem does have an easy solution. A sleeve hose protector slipped over the hose and fitting will keep you from inadvertently crimping the hose, and will spread the stress to prevent excessive bending.

Several companies market simple sleeves to slip over your hoses, but only Sherwood has made hose protectors a standard feature on all Sherwood regulators.

Stop by your local dive shop and look for the regulator with the built-in hose protection.

And, get all the facts on the full line of dependable Sherwood gear.

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Underwater Forum

The Inner Experience

I would like to mention two outstanding articles in the January issue of SDM: The Inner Experience of Diving [by Carlos Eyles] and, in Medifacts, Macho Virus [by Charles V. Brown, MD]. Both are very well done.

I am a 51 year old sport diver and love it. But I have seen and talked to many other divers who have given up, because of instructors or divemasters who feel that they are Marine D.I.'s. The sooner these macho instructors learn that it is a sport and not a try-out for the UDT, I believe this sport will zoom to the top.

BILL CROWELL
BROCKTON, MA

SKIN DIVER readers interested in purchasing the book, The Inner Experience of Diving: A Beginner's Guide to the Water Planet, *by Carlos Eyles, excerpted in the January '79 SDM, may do so by sending $4.99 plus 50¢ postage and handling (Calif. residents add 6% sales tax) to: Carlos Eyles, 925 Tia Juana, Laguna Beach, CA 92651.*

He Appreciates Women

My basic scuba class was shared with 49 wide-eyed enthusiastic divers. Those that survived the thrashing and floundering in the municipal pool really deserved their C-cards.

However, I never received any individual attention until the day of the ocean check-out when three other novices and I were assisted by a helpful and caring young lady named Cheryl. In spite of near-zero visibility that morning, we somehow maintained, thanks to this reassuring assistant instructor. That afternoon we enjoyed a fantastic dive at a beautiful beach where conditions had improved to about 50 foot visibility. Under Cheryl's direction we had a blast!

Since that first dive three years ago, I have observed women divers to be concerned partners. They stick close to their buddies and avoid risky situations. Women don't try to impress everyone with their diving. . . and I appreciate them as dive partners.

MICHAEL RICE
SAN FRANCISCO, CA

It's Catching

The following letter is one of several we have received in reply to reader Marc Liskin's question on "Scuba Sickness" (U/W Forum, January '79).

Marc, I am 16 years old, an advanced certified diver and, like you, all I do in school is talk about diving. All my friends call me Jacques-Yves Cousteau. I love the sport so much I work in a scuba shop part time. I also help in a basic scuba class and I know there are many people like you and me.

JOSE MONGE
SILVER SPRING, MD

There's A Reef, Where?

After reading your November '78 article about the artificial reef off Fire Island Light, N.Y., two dive buddies and I loaded my boat and headed toward that bright orange and white striped buoy which was "permanently" placed over the reef. After circling the area for nearly six hours we concluded that the entire reef must have joined its inhabitants and moved offshore for the winter — buoy and all! Our depth recorder failed to record so much as a twitch the entire day.

Back at the dock some local fishermen assured us that the reef was still there but the marker buoy has been missing since this past summer.

It seems now that the only hope of finding the reef is with a depth recorder and exact compass bearings from Fire Island Light and the nearby Coast Guard Light. The numbers I worked up from the navigational chart were obviously wrong.

Could someone provide SKIN DIVER Magazine with the exact compass bearings? I'm sure a lot of local divers would be interested because, around here, except for charter wreck diving, decent dive spots are scarce.

NED MCTAGUE
HOPATCONG, NJ

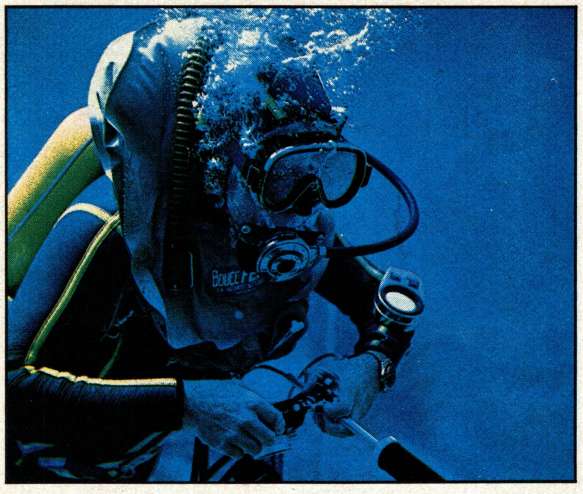
Praise for Spanish Bay

I recently returned from a vacation to Grand Cayman Island in the British West Indies where I stayed at Spanish Bay Reef. As a scuba diver, I can only describe the trip as *perfect* since all other superlatives fail . . . the diving is the ultimate.

Since Spanish Bay Reef is the only hotel on the north wall, we had the wall to ourselves to dive — 80°F water, 150 foot plus visibility and cathedral-like perfection below. No boat dive took longer than 15 minutes travel. Clinton, the boatmaster, knows his stuff! Once we satisfied Tom Ebro, the resident general manager (and divemaster during our stay) that we were certified and compe-

(Continued on Page 28)

Why the Rolex Sea Dweller never gets the bends.



Divers are not the only ones to experience decompression sickness, or 'the bends'. Watches, as well as people, can suffer in much the same way.

When diving to depths in excess of 300 feet a diver must rely on a breathing mixture containing a high percentage of helium.

T. Walker Lloyd, one of the world's leading scuba and saturation divers, takes up the story:

"Helium molecules are so small that no substance known to man can contain or inhibit this gas under pressure—even the Rolex Oyster case! When decompressing, this gas is unable to escape quickly enough from an ordinary watch case.

"I've actually known watches to explode as a result."

The Rolex Sea Dweller, however, is fitted with a patented gas escape valve. As the Oceanographic Consultant for Rolex, T. Walker Lloyd has kept in touch with the development of this unique feature since its conception.

"The operation of the valve is a masterpiece of simplicity. It is a spring-loaded one-way valve. When pressure within the watch becomes greater than ambient pressure, the valve simply opens allowing the trapped gas to equalise.

"In effect, this means that the watch decompresses with the diver."

T. Walker Lloyd has worked as diving supervisor for Dr. George Bass, when excavating a 4th-century Roman wreck in the Agean Sea.

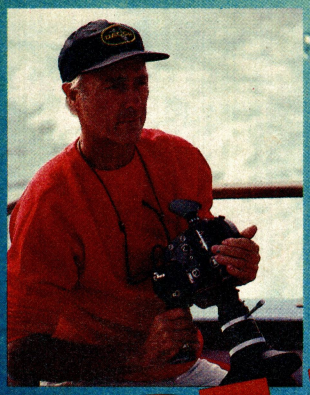
He was also a member of the first team to saturate on 95% nitrogen and 5% oxygen at a depth of 100 feet. During the experiment, the team made working dives of up 265 feet on compressed air. So he understands better than most the importance of highly accurate and reliable equipment.

The Rolex Sea Dweller is certainly a remarkable watch. And yet apart from the gas escape valve and a specially strengthened case, it is made in exactly the same way as any other Rolex Oyster.

Which means that if T. Walker Lloyd ever gets tired of underwater exploration, his watch will be equally at home in the frozen Arctic, the heat of the Sahara Desert, or at the top of Mount Everest.

ROLEX
of Geneva

Pictured: The Rolex Sea Dweller Chronometer. Available only in stainless steel, with matching bracelet.



photograph by Steve Earley

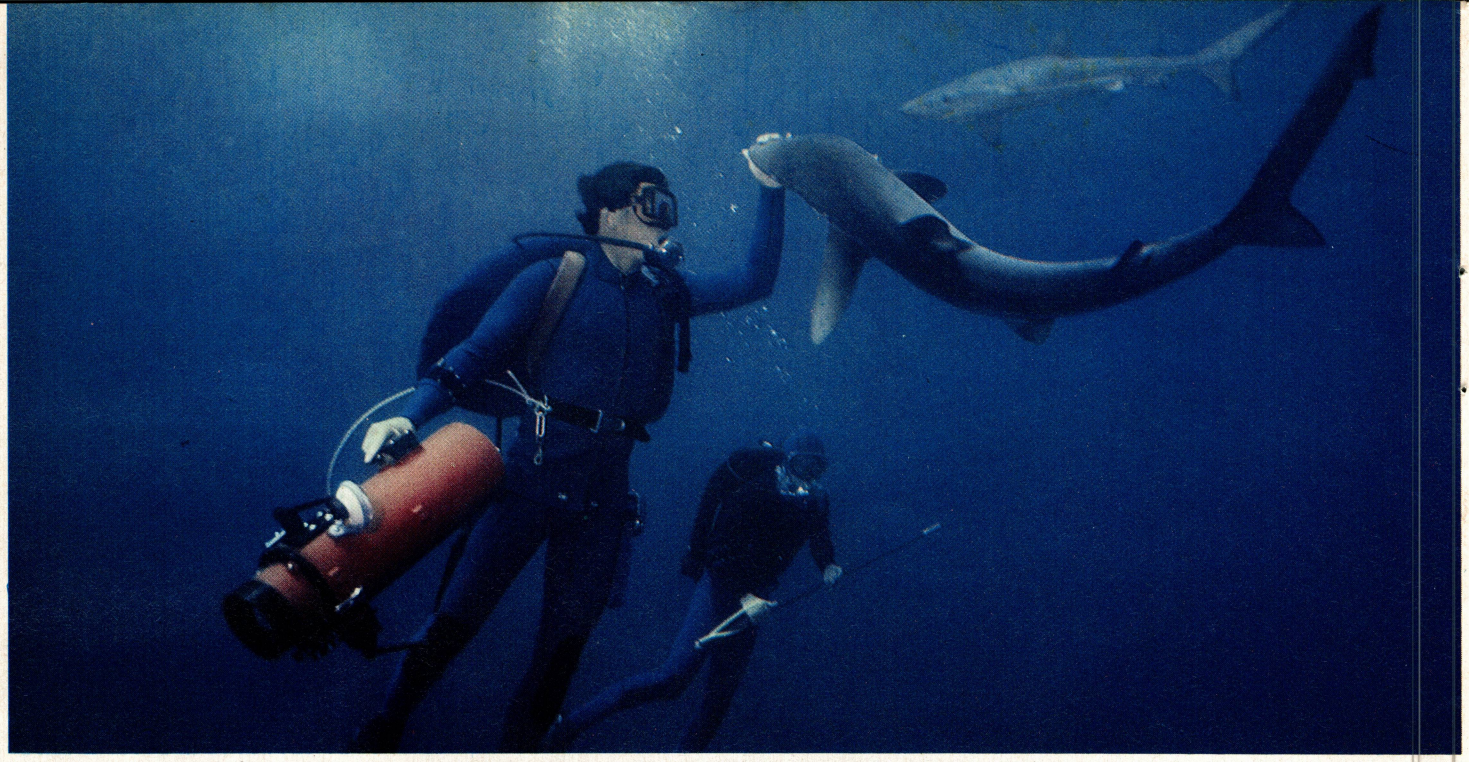
FOCUS ON SHARKS

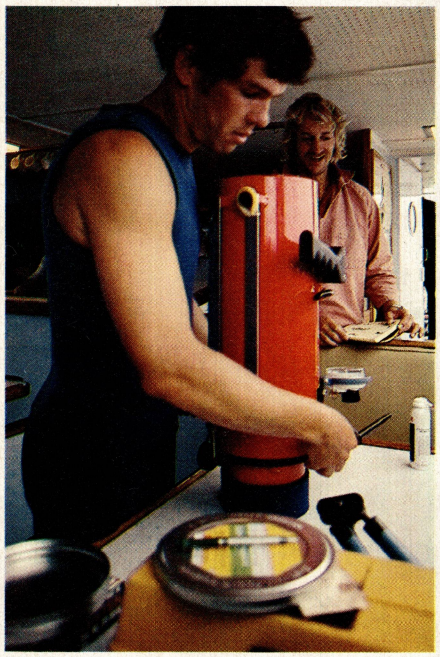
By Stan Waterman

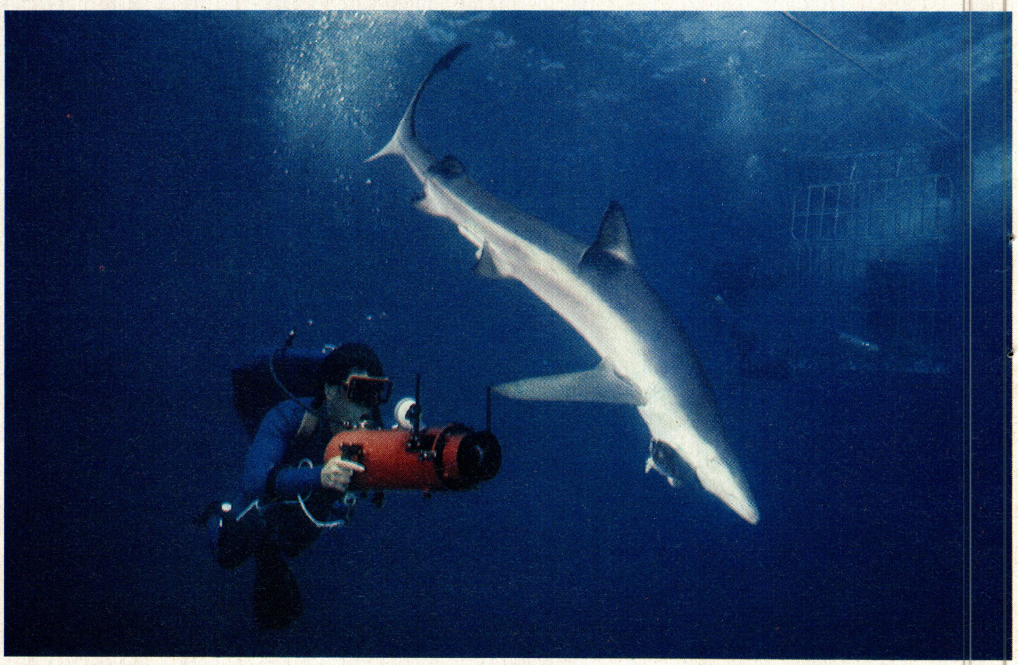
Something there is about the shark that continues to tickle the macabre fancy of man. And it is, of course, both simple and profitable to exploit. Hollywood hit the super jackpot with *Jaws* and then rode the momentum with the sequel, *Jaws II*, which was characterized by more horror and less art.

In passing let me say that the first *Jaws* was a brilliantly directed and edited film, a masterpiece of carefully modulated suspense. It was also based on an original story by Peter Benchley that was in turn based on his careful research into the behavior patterns of the great white shark. If the animal seemed real to millions of readers and viewers, it was because he was cut from real cloth. Those of us who have worked with the great white know that to be true. This box office appeal is a source of business for the

photograph by Howard Hall

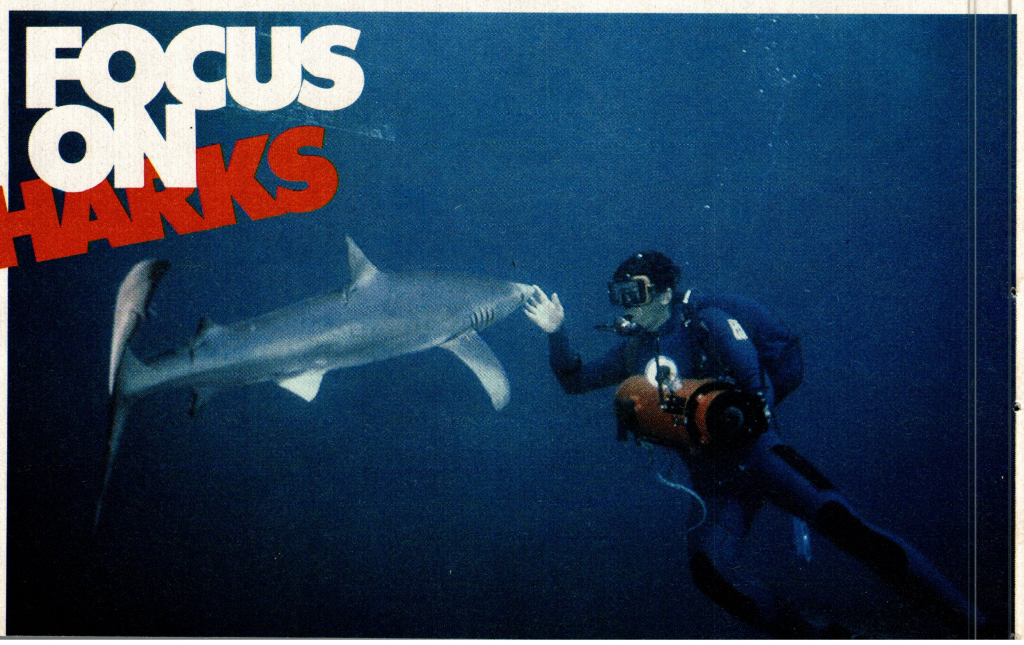






San Diego diver Howard Hall, shown preparing his camera aboard the *Bottom Scratcher* and diving with sharks in open water, has recently joined the ranks of U/W shark photographers. The beautifully streamlined oceanic blue shark (preceding page and at right) is considered semi-docile by veteran, shark-wise divers.

FOCUS ON SHARKS



handful of underwater cameramen and film producers who have had experience working with sharks. Peter Gimbel was the first to achieve broad box office significance by directing his camera at sharks. *Blue Water, White Death*, which he produced and directed, was shot more than ten years ago and is, today, still the classic documentary on sharks.

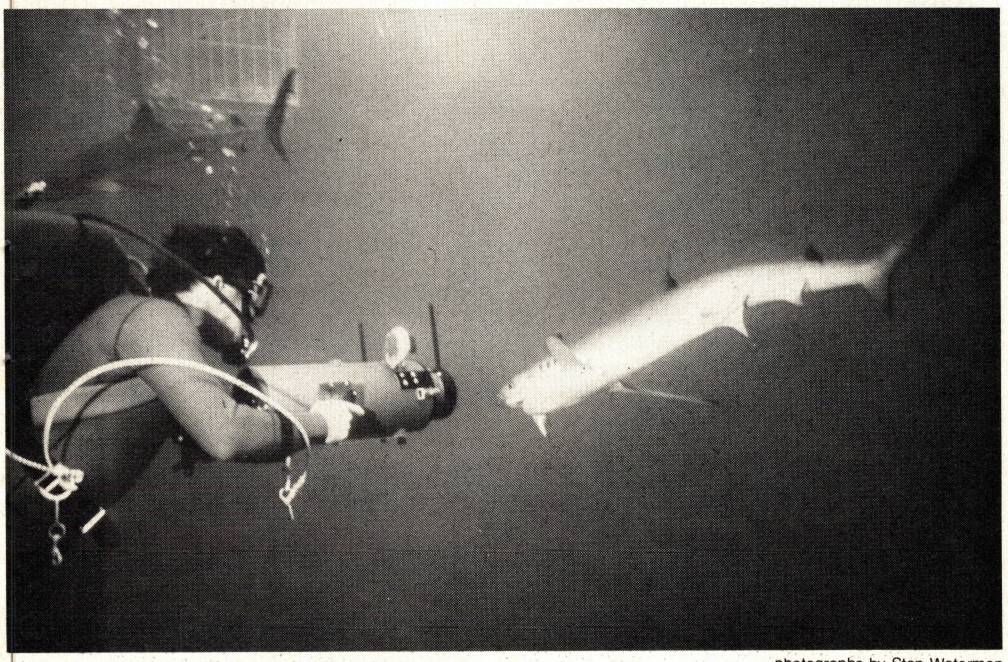
Ron and Valerie Taylor of Australia also worked on *Blue Water, White Death*, and in subsequent years have done more filming with the great white shark than all other underwater cameramen.

Hans Hass filmed sharks in the open water of the Aegean in the mid 40's, using rebreathers and simple but effective underwater 16mm camera systems of his own design. That took extraordinary courage since there was no precedent for working with sharks in those days. A veil of fear shrouded them. It was thought that swimming unprotected with oceanic sharks was suicidal.

Cousteau's team has, of course, worked extensively with sharks. The Nicklin and Jack McKenney. Howard Hall of San Diego recently joined the ranks. The first three photographers were responsible for the extraordinary shark footage that appeared in the Cornel Wilde adventure film, *Shark's Treasure*.

Under the direction of Al Giddings, the divers worked far out in the Coral Sea, 200 miles beyond the Barrier Reef. At an isolated reef complex named Marion Reef they stimulated the gray reef sharks (*Carcharhinus menisorrah*) to a feeding frenzy. McKenney, in that instance, was a subject on camera, powerheading sharks as they charged in upon him. At one point a shark he had just "banged" did a quivering loop in its death throes, coming down directly upon McKenney's head. Jack deftly finned aside, throwing a left hook to the shark's head that fended him off. Batman and Robin sound effects (e.g. Biff! Wang! Pow!) would have suited the scene well.

Giddings had to film the sharks attacking the bars of a cage in which the movie hero was supposedly taking cover. To do this, he removed the door of the cage, drove a rod through the hinge eyes and into the sand so that he could pivot the door in any direction from which the sharks were attacking and film through the bars. That sort of improvising initiative is typical of the man who has become one of America's foremost underwater cameramen.



photographs by Stan Waterman

Cousteau television series opened with an hour special on sharks. The great man well understood their box office appeal.

Ben Cropp of Australia, with an eye to marketing his underwater films in the U.S. television market, concentrated on sharks. His fare was occasionally seasoned with sea snakes.

Filming sharks in open water requires some degree of nerve (sometimes called "cool"). More important, an instinctive sense of how far one can go with the animal is required. Such shark sense is, of course, born of experience. Not so many divers are willing to enter into the experience on a blind trial basis. Thus, the ranks of diver/cameramen who work with sharks is thin. Presently in the U.S. the men most prominently associated with shark filming are Al Giddings, Chuck

Some years later I was part of the same team, filming the shark sequences for *The Deep*. We worked in the same general area, far out in the Coral Sea, with the same species of shark, the Pacific gray. It was no coincidence that the team and the shark species were the same. These two factors are very important in the matter of shark work. There is much that can be attempted and accomplished with an experienced team of shark-wise divers that one would never try to do alone or with inexperienced people. Further, what you may attempt with one species of shark could be fatal with another.

During the filming of *Blue Water, White Death*, Peter Gimbel, Ron and Valerie Taylor and I depended on one another and dared the open water with 100 or more oceanic white tip sharks that were feeding on a whale carcass. Those who saw the film will never forget the scene. It seemed like complete madness. We thought it was pretty wild, ourselves; but we had all had years of experience with sharks and thought we could get away with it — that the sharks would not attack us outright but would manifest only curiosity and interest.

It was Gimbel who pushed us to the moment of truth. He left the security of his cage and ventured out into the open. We followed and united as a team. Peter and Ron and I each handled a 35mm camera system so that we covered the action from three angles. Valerie Taylor carried a 12 gauge bangstick which she wielded like a billy. Without using the lethal charge on the device, she bopped sharks right and left with such vigor that she developed fatigue in her right elbow. We called this "Shark Elbow."

All four of us were besieged by sharks, as many as three white tips (*C. longimanus*) bumping and jostling each of us at once. We shoved them off with the cameras or kicked them away with our fins, never allowing them time enough for a trial bite. When the sharks actively fed on the whale carcass, they neatly severed off great crescent gobs of blubber, their caudal fins powering the quivering motion of their bodies. They fed at a leisurely pace, two or three at a time. Nothing approximating a frenzy ever existed.

Peter Gimbel sensed that he could film the feeding at point-blank range and that the sharks, their attention directed to their prey, would pay no attention to him, perhaps even accept him as another diner at the feast. His instinct was correct. His takes of the sharks' convulsive feeding, heads and jaws filling the motion picture screen, were sensational. No one before or since has so dramatically reduced the parameters of camera-to-shark exposure.

On occasions since then I have had opportunities to apply the same instinct with good visual effect. One such occasion was with a magnificent 14 foot tiger shark on the Australian Great Barrier Reef. John Harding, an Australian cameraman, and I were filming an ABC American Sportsman show with Peter Benchley. Working about 30 miles out from Heron Island, we had chummed in two fine tiger sharks. One of these — the 14 footer — was induced to feed on a large stingray that had been speared and set out for it. Peter, the cameraman and safety divers were neatly secured at the entrance to a coral cave, the bait being just outside the entrance. Peter's position was a slim six feet from the bait

FOCUS ON SHARKS

and his excitement mounted to a pitch he hadn't known since *Jaws* first hit the top of the best seller list. As the great shark made leisurely approaches to the bait, shaking and removing large parts of it each time, I had the strong feeling that, once the animal was engaged with the feeding, I could push to within inches of its head with the camera and did so. I believe that psychologically (if one may use such a term in shark/human relationships) the shark had directed its attention to the object upon which it was feeding, to the prey.

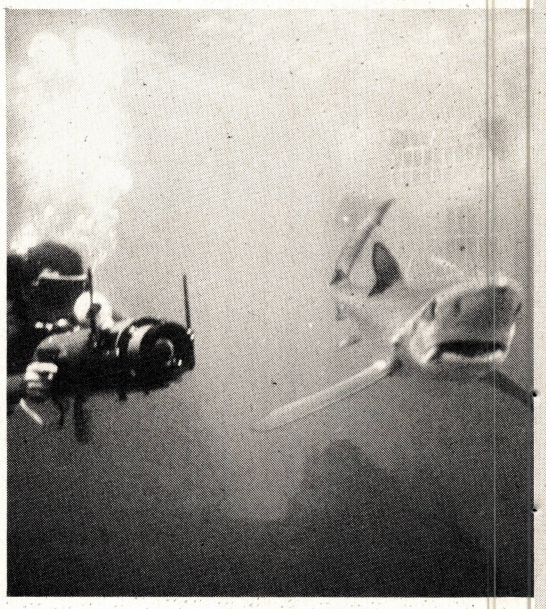
Most recently I applied this same instinct to the filming of an eight foot mako shark in deep water off the southern coast of California. The occasion was the production of a film on shark behavior for Anglia Broadcasting, a London-based television production group. At the time I had working with me a splendid team of shark-wise young men, all from San Diego and almost all graduates of Chuck Nicklin's famous Diving Locker. The team leader was Howard Hall. This young man had proven himself cool and effective in the thick of the shark action in the Coral Sea during the shooting of *The Deep*. He was then the chief safety diver. Now, working with me, he shared responsibility for the underwater filming. His team included Marty Snyderman, Larry Cochran and Steve Earley. Later, the team was joined by Chuck Nicklin, more veteran and experienced than any of us.

This team, perhaps the most shark-savvy and daring of any in the world, provided one of the favorable conditions I mentioned before; that is, to work with an experienced and reliable group. Their daring is an extension of their instincts which in turn develop from experience. It is not the daring of brave fools. In fact, their system of safety divers and unremitting visual alert is the finest I have ever encountered. It had to be.

In the course of working with the oceanic blue sharks *(Prionace glauca)* in the open ocean off San Clemente Island and the Coronados Islands, we found ourselves frequently in company with mako sharks (*Isurus oxyrinchus*). These heavy-set fast animals are closely akin to the great white and as different from a blue as a house cat is from a tiger. The blues converged on our chum line by the dozens. Howard and his team have learned how to handle them — actually hand-hold them and, indeed, feed them by hand. Into the milling, semi-docile company of blues the makos would appear like lethal fighters, fast nervous, aggressive and scarey. Safety divers and cameramen would close ranks.

My safety diver, Steve Earley (a young winner of the Our World — Underwater scholarship) found the odds dangerously out of control at one point when three makos arrived on the scene at the same time. They moved in and out of visual range continuously and there was no way to anticipate from which direction they would reappear. Steve's decision was to dispatch one of them so that he could visually cope with the other two. He did the job neatly with the McNair Bangstick. All safety divers carried one of these great equalizers at the ready but never loaded until the moment of truth. During the time of imminent attack or need for action the stick was kept cocked, the rubber stretched and the cartridge in the other hand, ready to slip into the chamber. It is fair to say that these seasoned divers considered a loaded stick far more dangerous than the sharks.

I have diverged from my story about how the instinct for filming feeding sharks was applied in this instance. A prime objective in the Anglia shoot was to attract a mako to a large albacore bait that was attached to the cage and to film at close range with a high speed camera the bite dynamics of the animal. With us was a young researcher from the University of Illinois, Clarise Prange, who was studying for her doctorate in the bite dynamics of sharks. She was equipped with a high speed Millikin system which was capable of 600 frames per second. The cage, owned by Howard Hall and Larry



Cochran, has a large open window through which the camera could be directed.

The bait was suspended two feet in front of the window. Clarise, with Marty as safety diver and bait tender, took up position in the cage, hoping for the big shot with the eight foot mako. At the same time I felt an excellent production shot could be done from just under the stern of our boat, the *Bottom Scratcher*, of the cage operation and the shark feeding. Distance from boat to cage was about 15 feet. Steve Earley rode shotgun for our exposed team. My son, Gordy, attended the Birns and Sawyer light.

With the stage set, we tended to minimize our presence to reduce the shyness the mako might feel about approaching the cage. The wait was long and getting colder every minute when the mako finally made his pass at the bait. A foot or more from the bait his jaws opened wide and worked convulsively in anticipation of the bite. This behavior pattern was one we had observed regularly with makos.

As the mako's mouth closed on the bait I moved quickly toward him, closing the distance with my wide angle lens until the shark's head, wildly thrashing to tear

loose the bait, filled the frame. I had counted on the shark being completely occupied with his feeding. He was and seemed to pay no heed to me at all.

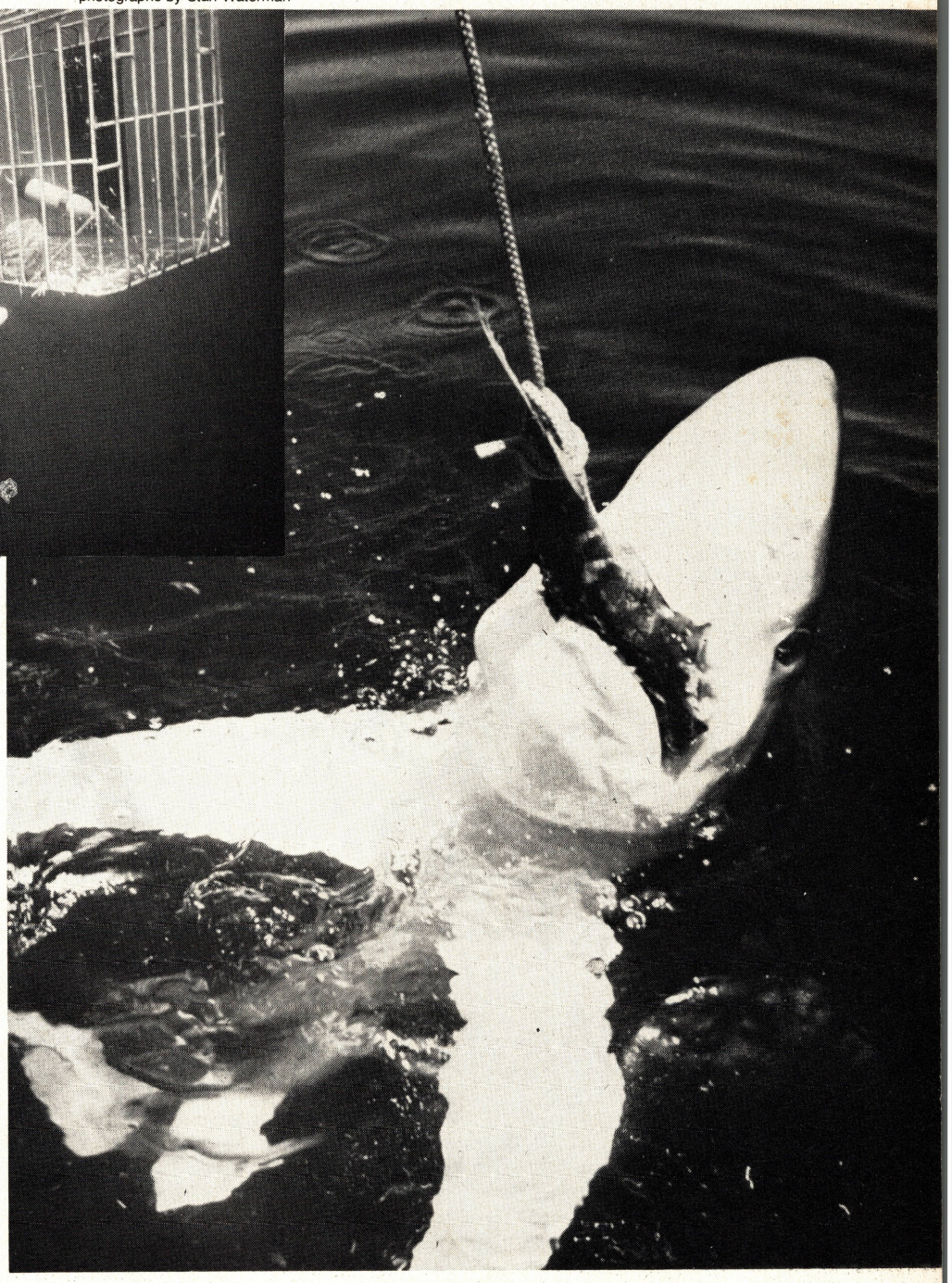
I had not anticipated that when the shark did break away with the bait he would chance to turn in my direction and run right over me. We collided in a maelstrom of foam. The camera, which I held before me like a shield, was jammed back into my face, almost dislodging my mask. Those on the surface, watching from the stern of the boat, saw the collision and next watched the shark break surface like a Poseidon missile, still shaking the bait. For me, all was foam and confusion. When it cleared the shark was gone and the camera still rolling, responding to my death grip on the trigger.

one point they smothered Howard so that he could not attend to all of them at once. During the melee one bit through his wetsuit and grazed his wrist.

But the close call that gave us all serious pause for thought occurred when Steve Earley was handling the lights for Howard. A large blue shark approached from directly overhead, seized Steve's head in his jaws and closed on a mouthful of neoprene hood. Howard was horrified to see his assistant being shaken like a rag doll. To his great credit (as a human being) his instinct was to help his friend, not to shoot the scene. He grabbed the shark by the pectoral fin and pulled him away, distracting him at the same time. Steve extricated himself from the jaws, straightened his hood and with monumental cool took up his position with the lights again. Later we examined his hood and found it well perforated by the teeth. His scalp was only slightly grazed.

This sort of experience is not likely to diminish the public's fascination with sharks. They will continue to be box office. Having survived evolution's course for more than 300 million years, they are alive and well and prospering in their ocean environment. It may be supposed that they will survive the human race, their instinct-motivated behavior less prone to self-destruction than our intelligence. In turn, those of us who work with these magnificent predators fervently hope that we may survive the experience with nothing worse than a shallow scratch and a perforated wetsuit.

photographs by Stan Waterman



Waterman reminds us that "nothing is certain about sharks," and diver Howard Hall (above) is always on guard. The photographs in this article were taken during a filming expedition in the Pacific Ocean off San Clemente Island and Mexico's Los Coronados Islands.

Two pairs of eyes, Gordy's and Steve's, were directed at me, rolling in their facemasks. My own were are large as a benthic monster's.

Thus the instinct to close in and film when the animals are feeding had proven correct again. This should by no means be taken as a certainty. Nothing is certain about sharks. While we can begin to anticipate the sharks' behavior through repeated experience with them, we try not to become complacent.

Drop your guard, take your luck for granted and the gods will strike you down. The ancient Greeks were sure of that. They called it *hubris*, the wrath of the gods. So far no one has been seriously bitten by sharks while filming them. It seems to me that such an eventuality is inevitable. On this last shoot the blue sharks became so excited when we encouraged their feeding that they bit our cameras as we shoved them away. At

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Medifacts

BY CHARLES V. BROWN, M.D.

BODY CHEMISTRY

Divers are always looking for new ways to help them become stronger, stay warmer, and be generally more comfortable in the water. This month, Dr. Brown's column includes a discussion of the effects of additives, such as vitamin B15, possible contaminants, such as silicone, and the mechanism of oxygenation.

VITAMIN B15

Bob Ramsey of Yorktown, Virginia, has inquired about the possible effects of pangamic acid (vitamin B15) on divers. He's heard that it increases gas exchange and wonders whether a dosage of 100 to 150 milligrams daily, tapering over a month to 50 milligrams daily, would predispose a diver to narcosis, bends or any other related disorders.

Answer: Pangamic acid occurs naturally in seeds and other common sources of B vitamins. It has been promoted through health food outlets as good for cardiovascular and rheumatic disorders. As far as we know, its relation to dive disorders has not been tested. Aside from some protective effect of vitamin E against oxygen convulsions, we are not aware of any vitamin supplement that will either increase or decrease the likelihood of any diving disorder. But then, we still have a lot to learn.

DECONGESTANTS

Decongestants are often recommended for for divers with nasal congestion. Instructor Bobby Cox of Mobile, Alabama, has learned that decongestants are vasoconstrictors — that is, they constrict blood vessels and reduce circulation. He writes to inquire whether taking a decongestant after diving would slow down out-gasing and so affect the use of the decompression tables.

Answer: You raise an excellent point. Tissues can absorb or release a gas only as fast as the blood stream brings it to them or carries it off. Therefore, in-gasing and out-gasing are indeed dependent on the state of the circulation.

Nasal decongestants do constrict the arterioles supplying the nasal membranes. However, their action on vessels elsewhere is variable, and the effect is altered by many compensatory reflexes. Pseudoephedrine (the active agent in Sudafed) for example may reduce circulation in the skin a little, but it increases circulation to the kidneys and brain.

At any rate, nasal decongestants used in spray form do not enter the circulation in large enough amounts to have much effect beyond the nose. Even in tablet or capsule form, doses recommended for the nose do not usually have important effects elsewhere. It seems unlikely that the use of decongestants would alter gas transport enough to make the Navy tables invalid.

ENDURANCE DRINK

Those who spend a lot of time in cold water have an energy drain problem, and J. H. Muscat of Tucson, Arizona, has a sweet solution. He mixes one part each of honey, glucose, and orange juice concentrate with two parts of water. The game plan is to have a good supper the night before diving, a very light breakfast, and after that nothing but the magic potion. You get to drink one cupful just before diving, another four to six hours later, and a third after three or four hours more (who dives that long?). Mr. Muscat wrote us to share his formula, and to invite comment on its virtue.

Answer: The theory is good. Coping with prolonged cold stress requires a lot of fuel. The primary fuel is blood sugar, and its ready reserve form is liver glycogen. If one doesn't eat, liver glycogen runs out after an hour or so of exercise. Ordinary foods will replenish it, but the process of digestion consumes energy, and also diverts blood flow from skeletal muscle to the intestinal tract. Simple sugars provide fuel quickly, at very little metabolic cost.

Nevertheless, I have reservations about Mr. Muscat's plan. His solution is too concentrated, and too much is taken at too-long intervals. A cupful all at once would nauseate some people. Rapid absorption from the intestine would raise the blood sugar too high and provoke excessive release of insulin. The insulin would drive a lot of the sugar into fat depots, where it would be converted into storage fat, and some of us at least don't need any more of that. Finally, many people can't turn their insulin off quickly enough, and their blood sugar would be driven too low. This is called reactive hypoglycemia, and it leaves a diver less able to handle cold than he or she was to start with.

Our metabolic mills are not all programmed identically, and what works for one isn't necessarily so good for others. Most divers would get more mileage from Muscat's nectar if they'd add water and

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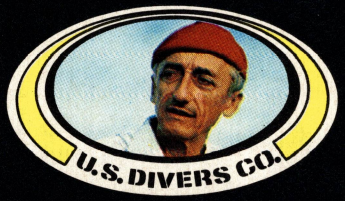

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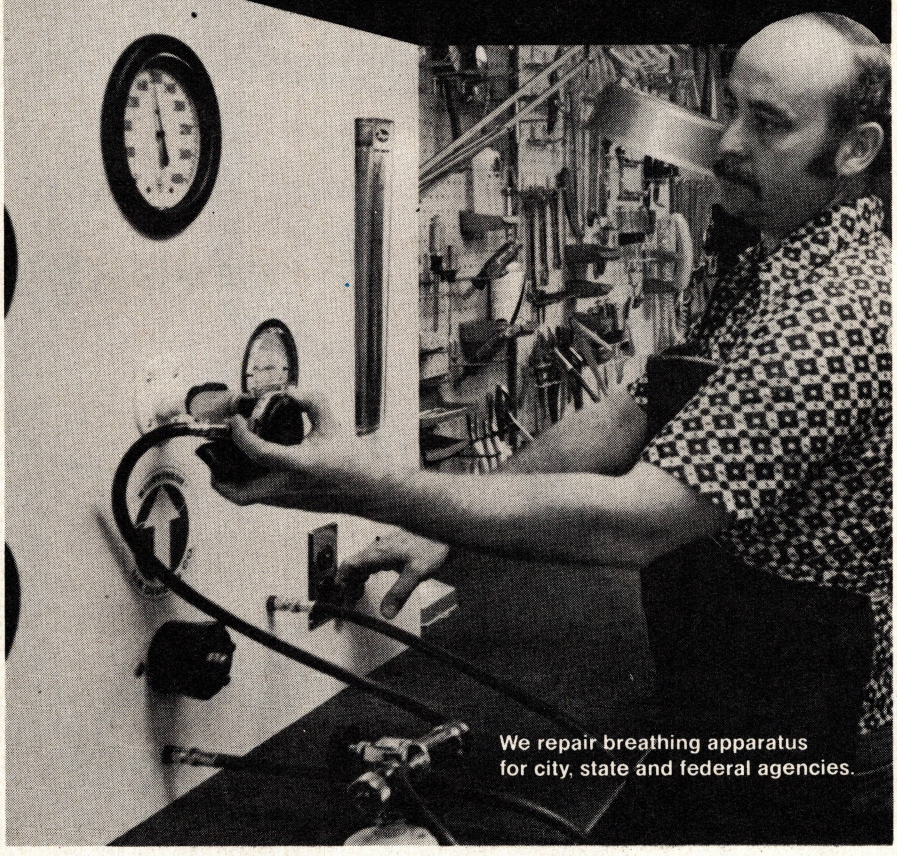

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take smaller doses at more frequent intervals. The objective is to keep liver glycogen charged up without pushing the blood sugar level above normal.

SILICOSIS

Robert Dummett of North Miami, Florida, calls attention to the widespread use of silicones for lubricating the internal working parts of scuba regulators and coating the inside of tanks after visual inspection. He asks whether breathing silicone under pressure might subject sport divers to the risk of developing silicosis.

Answer: Forget it. Silicosis, a disease marked by fibrosis (scarring) of the lungs is not caused by silicone. It is caused by silicon dioxide, commonly called silica, when tiny particles are inhaled over a long period of time. It's a problem for miners, not divers. Silicone lubricants are something else. Chemists call them organo-silicon oxide polymers. They are most unlikely to be inhaled in any significant amount. Even if they were, we are unaware of any lung disease that might possibly result.

OXYGEN AND CO_2

Sidney Moore of Florence, S.C., wonders about the mechanism used by the body's tissues to extract oxygen from the blood. How do high partial pressures affect this mechanism? He would also like some information regarding carbon dioxide retention. Namely, what are its specific symptoms?

Answer: The cells in tissue extract oxygen from the tissue fluid which bathes them. The tissue fluid in turn gets its oxygen from the blood plasma. As the oxygen level in the blood plasma falls, oxygen is released from hemoglobin to replace it. Since a diver at depth breathes air with a high partial pressure of oxygen, more oxygen will be carried in the plasma, so less will have to be released from hemoglobin. If a person lies quietly in a chamber and breathes oxygen at three atmospheres absolute, enough oxygen will be carried dissolved in the plasma to entirely supply bodily needs, and he or she won't have to extract any oxygen from hemoglobin.

The body always retains some carbon dioxide — and, in fact, can't do without it. However, carbon dioxide retention beyond the normal level leads to excess. The term "retention" is commonly used to mean excess, so the symptoms are the same. The symptoms are an increased urge to breathe, headache, reduced tolerance for further exertion, and eventually narcosis and unconsciousness. (A discussion of carbon dioxide problems related to diving can be found in NAUI News, Nov. '77, page 23.)

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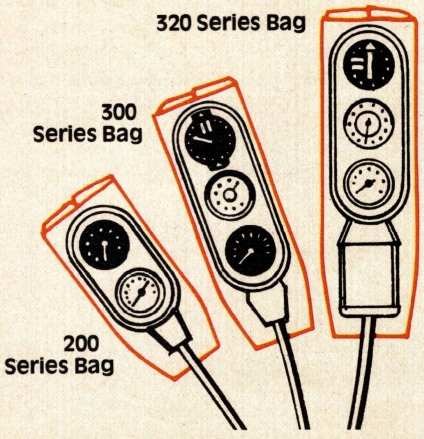

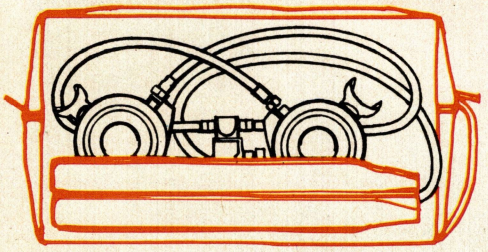

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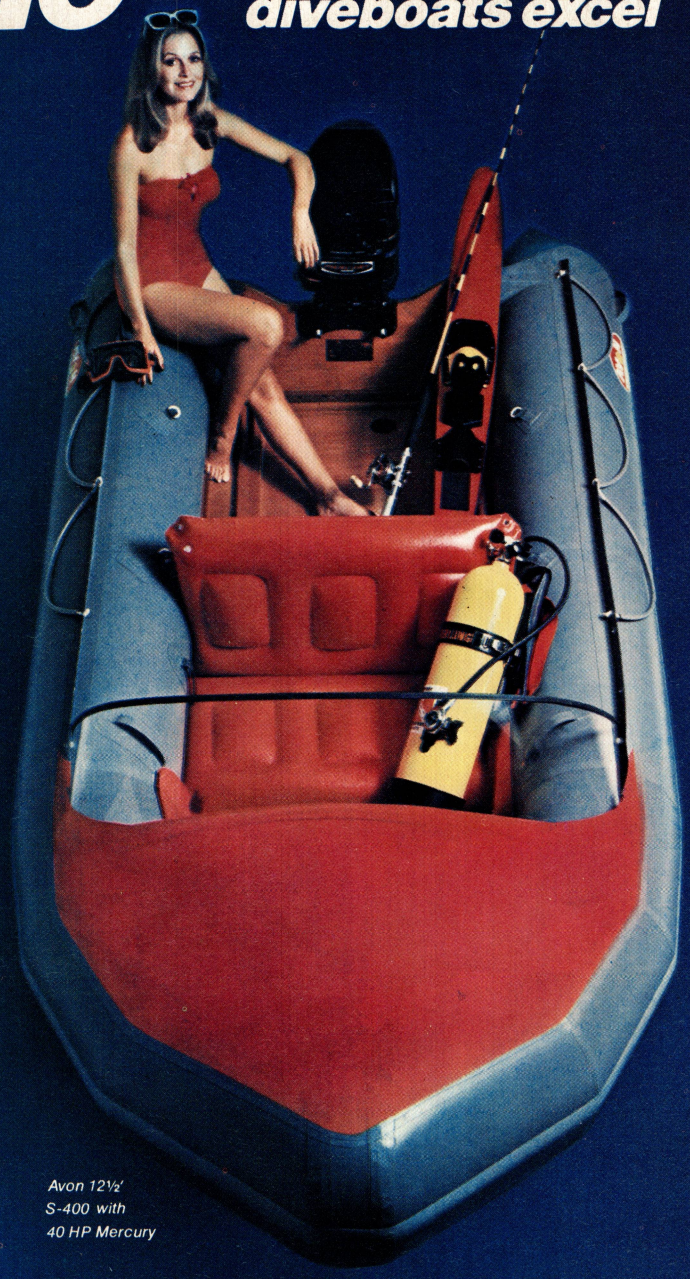

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MEDIFACTS

CRANIOTOMY

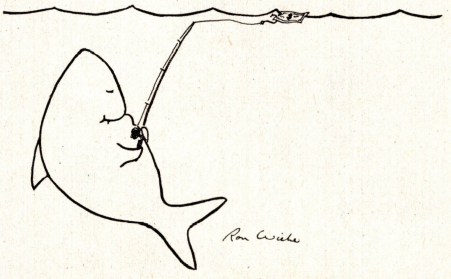
In 1975 a diver in St. Petersburg, Florida, had a head injury. He underwent a craniotomy at the Mayo Clinic. The operation required removal of a section of skull and, as a result, he has an indentation in his forehead. It is hardly noticeable, but it does prevent his facemask from sealing. Silicone injections have been suggested as a fix, but he's concerned whether the pressure underwater might displace the silicone.

Answer: Injected silicone would not be affected by pressure, and that might be your best way to go. However, you do have other options. One is to wear one of the many hard hats common in commercial diving (these have some disadvantages). Another is to cover the indentation with a thin but rigid sheet of plastic with bevelled edges. Your mask should seal to it, and the air pocket formed would be too shallow to cause significant external squeeze at depth. A third possibility is to mold rubber or other material to exactly fill the indentation and present a smooth outer surface for mask sealing. Fourth, a clever do-it-yourselfer could adapt a mask by extending part of its skirt, using material from another mask. I know of no maker of masks who offers custom service, but you could try writing directly to manufacturers. Get their addresses from a dive shop.

OCEANS INTERNATIONAL

Ricardo Gutierrez, a physician from Argentina, is interested specifically in underwater medicine and would like to know whom to contact for further information on this field. He is primarily interested in deep, saturation diving.

Answer: We are pleased at the increasing interest in dive medicine in other nations. The oceans are international, and their exploration and exploitation require international endeavor and cooperation. I have sent Dr. Gutierrez a bibliography, and information about the Undersea Medical Society and other organizations. These are available to other readers upon request.



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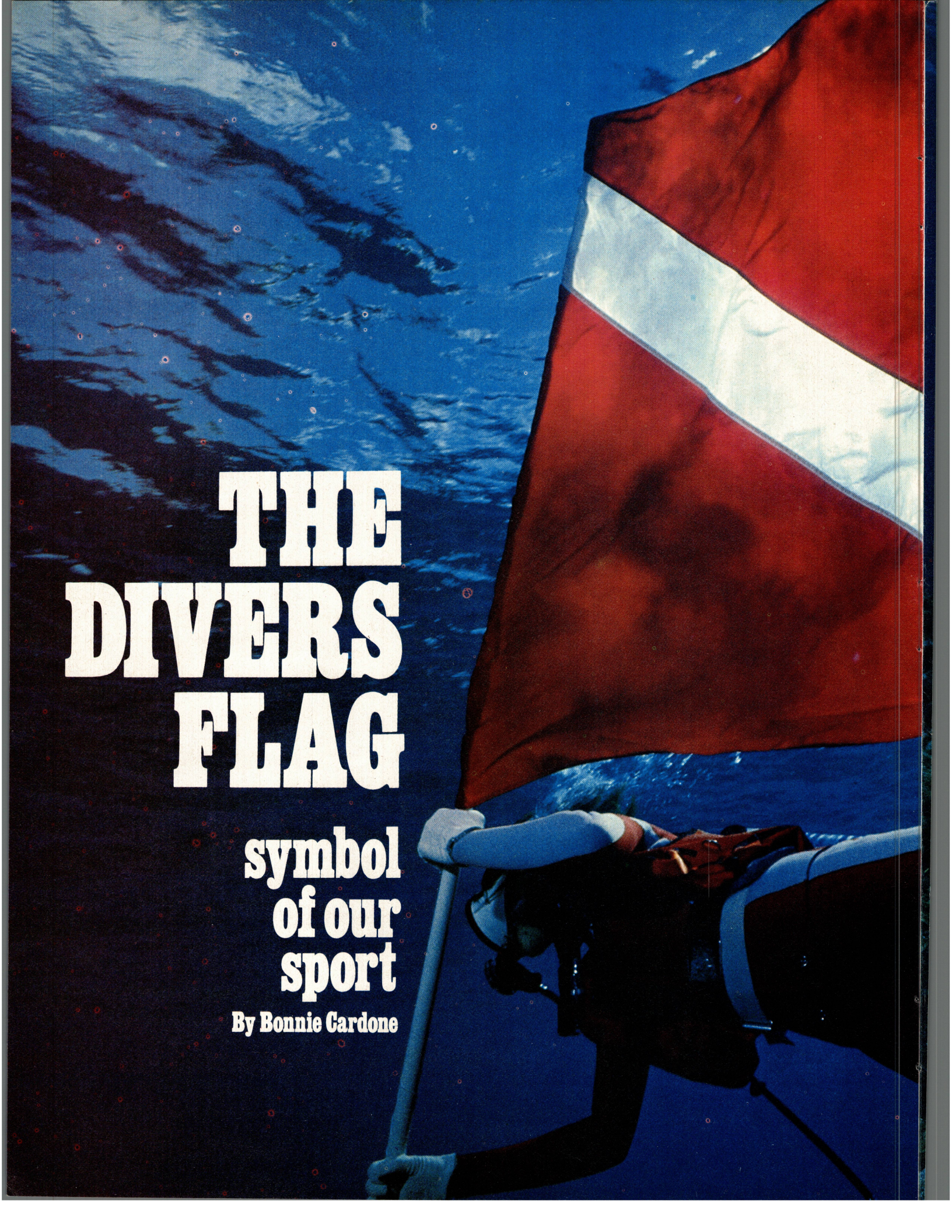


THE DIVERS FLAG

symbol of our sport

By Bonnie Cardone

Divemaster Dee Scarr unfurls the divers flag over Snapshot Reef, San Salvador Island.

In the 20 years since the red and white diver down flag came into existence, it has achieved widespread recognition and distribution. You see it everywhere: as a decal on car windows, as a patch on jackets and even as charms, pendants and cufflinks. Sometimes it seems as if it is found everywhere except on the water.

Decals, patches and jewelry all have their places and even help educate the public as to the meaning and use of the divers flag; but the reason the flag was invented was to protect divers while they go about their underwater activities.

As a symbol of our sport the flag is very graphic, but let's not forget why it evolved. More than a symbol, it is a warning signal to boaters announcing, "There is a diver down, stay clear." It also serves to pinpoint the whereabouts of divers so other divers can find them and so beach lifeguards can keep a watchful eye on them. It helps to bring separated dive buddies back together.

The flag, as we know it today, is a product of Yankee ingenuity, and is used by sport divers in the U.S. and Canada. It was designed for high visibility on the water, which is why it is red and white. However, in international waters and in some other countries, there is another flag

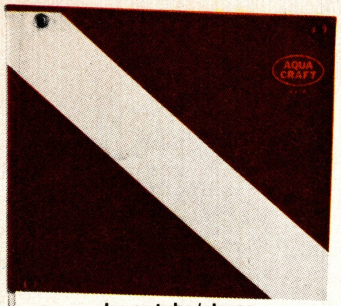
Photography by Geri Murphy

DIVERS FLAG LAWS BY STATE

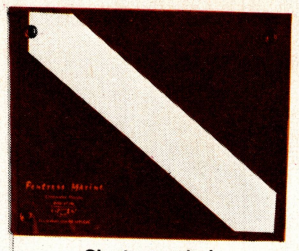
STATE/AGENCY	SIZE/SHAPE	BOATS: MIN. DISTANCE, MAX. SPEED	DIVER DISTANCE	METHOD OF DISPLAY	REGULATION NUMBER
ALABAMA Marine Police Division 64 North Union St., Montgomery, AL 36130	12" square	100', idle speed	50'	Prominently visible from all directions	Alabama Water Safety General Laws and Regulations, Regulations 6 and 15
ALASKA Dept. of Transportation & Pub. Facilities, Div. of Harbor Design & Const., Pouch Z, Juneau, AK 99811	N/S*	N/S	N/S	N/S	None
ARIZONA Game & Fish Department 2222 W. Greenway Road, Phoenix, AZ 85023	N/S	N/S	N/S	N/S	Arizona Boating Laws, Article 6, 5-362
ARKANSAS Game & Fish Commission #2 Natural Resources Dr., Little Rock, AR 72205	Square, size N/S	N/S	300'	On boat or float	Fishing Laws, Regulation 51.03
CALIFORNIA Dept. of Navigation & Ocean Development, Operations Division 1629 "S" Street, Sacramento, CA 95814	N/S	Exercise precaution	N/S	N/S	California Administrative Code, Section 7008, Harbors and Navigation Code, Section 659
COLORADO Public Safety Section, Div. of Parks & Outdoor Recreation 13787 S. Highway 85, Littleton, CO 80125	Rectangular, size N/S	N/S	100'	At or near point of submergence, must be visible from at least 300'	Colorado Revised Statutes, Title 33-31-106
CONNECTICUT Dept. of Environmental Protection, Pub. Information & Education State Office Building, Hartford, CT 06115	N/S	50'	50'	N/S	Connecticut General Statutes, Section 15-135
DELAWARE Dept. of Natural Resources & Environmental Control Div. of Fish & Wildlife, P.O. Box 1401, Dover, DE 19901	N/S	N/S	N/S	N/S	No state laws
FLORIDA Dept. of Nat. Resources, Div. of Law Enforcement 202 Blount Street, Tallahassee, FL 32304	12" square minimum	N/S	N/S	Free-flying	Florida Statutes 861.065
GEORGIA Dept. of Nat. Resources 270 Washington St., S.W., Atlanta, GA	Uniform	N/S	N/S	N/S	No state laws
HAWAII Boating Branch, Dept. of Transportation 79 S. Nimitz Highway, Honolulu, HI 96813	Square, size N/S	100', 5mph	50'	Boat or float	State Boating Regulations, Section 7.09
IDAHO Dept. of Law Enforcement, Motor Vehicle Division P.O. Box 34, Boise, ID 83731	N/S	N/S	N/S	N/S	No state laws
ILLINOIS Conservation Police 100 E. Washington, Springfield, IL 62706	N/S	Exercise caution	N/S	Attached to buddy team	Illinois Department of Conservation Policy and Procedural Manual Code 37.54; various county and/or municipal regulations
INDIANA Enforcement Div., Dept. of Nat. Resources, Rm. 606 State Office Bldg., 100 N. Senate Ave., Indianapolis, IN 46204	N/S	Exercise caution	N/S	N/S	General Property Regulations, Section 11, item C
IOWA Conservation Commission, Wallace St. Office Bldg. Des Moines, IA 50319	12 x 15" minimum	Exercise precaution	N/S	N/S	Code of Iowa, Ch 106; Administrative Code Ch 290-31.10 and Ch 290-6.1
KANSAS Fish & Game Commission, Pratt Headquarters Box 54A, RR 2, Pratt, KS 67124	21" square	N/S	N/S	On buoy	KSA 82a-821, KSA 82a-822
KENTUCKY Div. of Water Enforcement 114 W.Clinton St., Frankfort, KY 40601	12" square minimum	100'	50'	On a buoy or similar floating device	601 KAR 25:160
LOUISIANA Dept. of Wildlife & Fisheries 400 Royal Street, New Orleans, LA 70130	N/S	N/S	N/S	N/S	No state laws but use is recommended, especially in the waters of the Gulf of Mexico
MAINE Dept. of Conservation Bureau of Parks & Recreation, Augusta, ME 04345	N/S	100'	Immediate area	Float or boat	Uniform State Waterway Marking System, Section III-D-8
MARYLAND Natural Resources Police Tawes St. Office Bldg., Annapolis, MD 21401	5 units in length, 4 units in height	150'	N/S	Boat, visible for at least 150'	Boating Handbook for Maryland Waters, Code of Maryland Regulations, 08.02.04.05 (for commercial oyster divers)
MASSACHUSETTS Div. of Marine & Recreational Vehicles 64 Causeway Street, Boston, MA 02114	12 by 15" minimum	100', 10 mph	100'	Boat or float	State Boating Laws, Section 13, Acts of 1974 Ch. 714
MICHIGAN Dept. of Nat. Resources, Law Division Stevens T. Mason Bldg., Lansing, MI 48926	14 by 16" minimum	100'	100'	Buoy or boat	Marine Safety Act, Act 303, P.A. 1967, Section 101 C.L. 281.1101
MINNESOTA Dept. of Nat. Resources, Boat & Water Safety Box 46, Centennial Bldg., St. Paul, MN 55155	12 by 15" minimum	150'	50' unless entire perimeter of dive area is marked	Upper edge of flag must be at least 30" above water	Minnesota Statute 361.085
MISSISSIPPI Boat & Water Safety Commission 720 N. President St., Jackson, MS 39202	14 x 16" minimum	100', motor stopped	50'	At least 3 feet above surface of water	No state law, Coast Guard recommendations only
MISSOURI Water Patrol P.O. Box 603, Jefferson City, MO	12 by 16"	50 yard radius	50 yards	3 feet above the water if on a float; visible for 360° if on boat	Scuba Diving — Flag Regulations

MONTANA Dept. of Fish & Game 1420 E. 6th, Helena, MT 59601	Square	100'	100'	N/S	No state law; publicity from scuba clubs and Dept. of Fish and Game
NEBRASKA Game & Parks Commission 2200 North 33rd, Lincoln, NE 68503	12" square minimum	Approach with caution	150'	Buoy or float	Fishing Guide, State Park Regulations
NEVADA Dept. of Fish & Game P.O. Box 10678, Reno, NV 89520	Square	N/S, 5 mph while in vicinity of divers	N/S	N/S	No state laws; regulations apply only to Lakes Mead and Mohave and the Colorado River
NEW HAMPSHIRE Dept. of Safety, Marine Division Hazen Drive, Concord, NH 03301	N/S	75', not to exceed headway speed	N/S	3' above water line	RSA 270:31
NEW JERSEY Bureau of Marine Law Enforcement, Marine Police P.O. Box 1889, Trenton, NJ 08625	18 by 18" minimum	50'	50'	Buoy, boat or float	NJSA 12:7-34.49 (NJAC 7:6-1 42), special provisions for Manasquan, Barnegat and Shark River Inlets and individual municipal governments
NEW MEXICO State Park & Recreation Div. P.O. Box 1147, Santa Fe, NM 87501	N/S	150', exercise caution	N/S	Boat or float	State Park Regulation #10
NEW YORK Parks & Recreation, Empire State Plaza Agency Bldg. #1, Albany, NY 12238	12 by 12" minimum	100'	100'	At least 2' above surface of water	New York State Navigation Law, Section 35-b
NORTH CAROLINA Wildlife Resources Commission Raleigh, NC 27611	N/S	50'	N/S	N/S	Motor Boat Owners Guide, p. 24
NORTH DAKOTA Game & Fish Department 2121 Lovett Ave., Bismarck, ND 58505	12" square minimum	N/S, exercise precaution	N/S	N/S	Fishing Regulations
OHIO Dept. of Nat. Resources, Div. of Parks & Recreation Fountain Square, Columbus, OH 43224	N/S	N/S	N/S	At the water's surface	NRp 7.10
OKLAHOMA Lake Patrol Division P.O. Box 11415, Oklahoma City, OK 73136	20 by 24" minimum	150'	N/S	Buoy	Boat and Water Rules, Regulations and Safety Laws, 721-722
OREGON State Marine Board 3000 Market St., N.E., #505, Salem, OR 97310	N/S	N/S, exercise precaution	N/S	N/S	Oregon Administrative Rule 250-10-210(1); Statutory authority: Oregon Revised Statute ORS 488.830(1)
PENNSYLVANIA Fish Commission, Watercraft Division P.O. Box 1673, Harrisburg, PA 17120	Not less than 14" or more than 24" square	50'; slow min. ht. swell speed between 50-100'	N/S	Buoy	Pennsylvania Boating Regulations, Chapter 4, para. 4:20
RHODE ISLAND Div. of Boating Safety Quonset Admin. Bldg. #7, Davisville, RI 02854	12" square for float 18" sq. for boat	50'	N/S	Float or boat	Rhode Island General Laws 46-22-24
SOUTH CAROLINA Boating Division P.O. Box 12559, Charleston, SC 29412	N/S	N/S	N/S	N/S	No state laws
SOUTH DAKOTA Dept. of Wildlife, Parks & Forestry Pierre, SD	8 by 10", minimum, 4 units by 5 units	75'	75'	Float, boat, rubber tube	Chapter 42-8-44.1 of codified laws
TENNESSEE Wildlife Resources Agency P.O. Box 40747, Nashville, TN 37204	N/S	Avoid area entirely	N/S	In immediate area	Rules and Regulations, Chapter 1660-2-6-.01
TEXAS Parks & Wildlife Dept. 4200 Smith School Rd., Austin, TX 78744	N/S	N/S	N/S	N/S	No state laws
UTAH Div. of Parks & Recreation 1596 W. N. Temple, Salt Lake City, UT 84116	Standard	N/S	N/S	N/S	Better Boating in Utah (73-18b-1)
VERMONT State Police Headquarters Montpelier, VT 05602	N/S	N/S	N/S	N/S	No state laws
VIRGINIA Commission of Game & Inland Fisheries P.O. Box 11104, Richmond, VA 23230	N/S	N/S	N/S	N/S	No state laws, but Commission of Game and Inland Fisheries attempts to educate boating public about meaning of flag
WEST VIRGINIA Dept. of Nat. Resources, Div. of Law Enforcement 1800 Washington St. E., Charleston, WV 25305	10" square minimum	100', no wake speeds	50'	2 flags, not more than 100' apart, top of flag not less than 3' above surface of water	West Virginia Boating Regulations, Section XIX; State Fishing Regulations
WASHINGTON Parks & Recreation Commission, 7150 Cleanwater Lane Thurston Airdustrial Ctr., P.O. Box 1128, Olympia, WA 98501	N/S	N/S	N/S	N/S	No state laws or local regulations
WISCONSIN Dept. of Nat. Resources P.O. Box 7921, Madison, WI 53707	12 by 15" minimum	N/S	50'	Must be visible from any point on the horizon and clearly apparent at 100 yards	Wisconsin Boating Regulations, S.S. 30.70
WYOMING Game & Fish Department Attn: Watercraft, Cheyenne, WY 82001	N/S	Exercise precaution	N/S	N/S	Wyoming Boating Information, Section 6, g

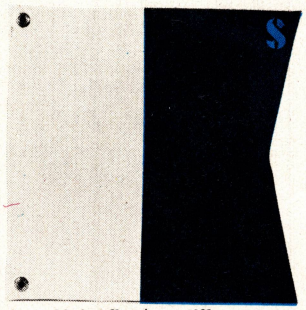
*Not specified



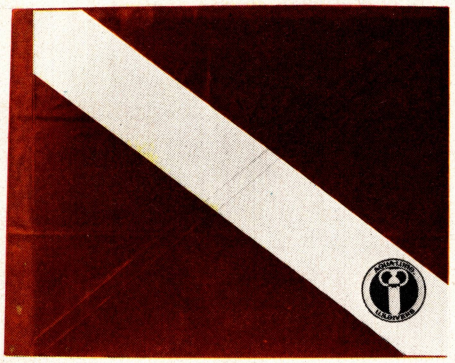
Inner tube/clamp



Cleat mounted

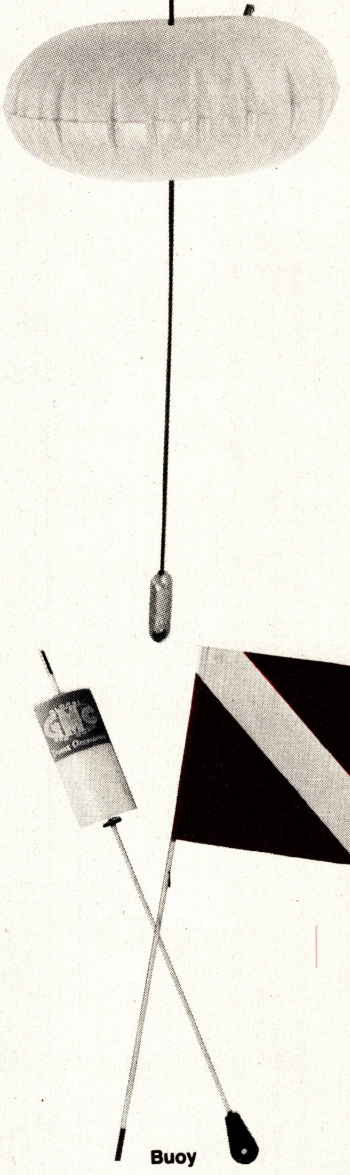


Alpha flag/no stiffener



Flag/stiffener

Inflatable buoy



Buoy

Flags come in a variety of shapes and sizes. Some have stiffeners to keep them straight. Some can be flown from, or mounted on, boats; some attach to inner tubes; some have their own Styrofoam buoys or inflatable floats. Here are examples of the types of flags available and, on the next page, a list of manufacturers. Dacor's NDFL model giant flag is shown on the opening pages of this article.

Coast Guard when a diver is down and has been adopted by CMAS. It is to be flown whenever divers are in the water 12 miles from U.S. owned land.

It became obvious when research for this article was being done that those who make our laws know little or nothing about divers, diving or the divers flag. About all that is agreed upon when the flag is even mentioned is that it should be red with a white diagonal stripe. Whether the flag should be square or rectangular and how wide the stripe should be depends upon who is writing the regulations. Often, these are not defined, but when they are, each lawmaking body has its own ideas.

There seems to be only one large group in the United States that has made specific recommendations regarding the divers flag: the Underwater Society of America. It recommends:

"1. The flag presently in common use for diving shall be known as the 'Divers Flag,' no apostrophe after the 'r' in divers.

"2. The shape of the flag shall be square.

"3. The colors of the flag shall be red background with white diagonal stripe.

"4. The diagonal white stripe shall extend from the top of the hoist to the bottom of the fly. The white stripe shall be one-fifth the width of the flag in width.

"5. Sizes shall be:

a. 12 inches square [When flown from a float of the one- or two-man size.]

b. 21 inches square [When flown from boats up to 40 feet in length.]

c. 33 inches square [When flown from boats up to 80 feet in length.]

"6. The flag shall mean that a diver is down and requests 100 feet of clearance."

Many of our states are not aware that there are two flags. Several have laws which specify that the international flag be flown whenever divers are down and then describe said flag as red with a diagonal white stripe.

There is also confusion on how close divers should stay to their flag and how far boaters should stay from it. Less than half of the states specify a distance for either; but of those who do, many expect divers to remain as close as 50 feet, some say 100 feet, one says 300 feet and one says 50 yards. The minimum distance boats must stay from the flag is often the maximum distance divers can stray — which could easily put the two on a collision course. Divers would be wise to be proficient in underwater navigation because it is easy to swim more than 50, 100 or even 300 feet from the flag on a tank of air and thus surface too far away for it to provide any protection. There should be a margin of safety here. For example: Divers should stay within 150 feet of the flag and boaters, 200 feet, but only a couple of states recognize this.

In many states, divers who fly the flag when they are not actually in the water are in violation of the law. In some states, boaters must lower the flag between dives when all divers are aboard.

Fifteen states specifically prohibit diving in certain areas. They are: Hawaii, Kentucky, Minnesota, Missouri, Nebraska, New Jersey, North Carolina, North Dakota, Ohio, Rhode Island, Tennessee, Utah, West Virginia, Wisconsin and Wyoming. Printing the prohibited areas would require too much space on our chart, but

if you live in one of these states or plan to dive in one of them, write for a copy of the rules. Usually the intent of the law is to make sure divers do not: ". . . intentionally or unintentionally block or obstruct any boat in any manner from proceeding to its destination where a reasonable alternative is unavailable." That's the way Kentucky words it. In Kentucky and Wisconsin, divers also may not: ". . . interfere with anyone fishing," and in Nebraska, North Dakota and West Virginia, they may not dive in water skiing areas.

Utah and Rhode Island have a law that

THE DIVERS FLAG

does not appear on the books in other states. Divers diving at night in these two states must fly an illuminated flag.

It can be easily seen that there is no set of common regulations applying to diving and the divers flag. Each state has its own and local authorities often have more. This is partly because dive spots differ in each state. A beach in New Jersey, for example, is obviously not the same as a Michigan quarry or the Mississippi River. Divers and boaters should all be familiar with the regulations in their favorite boating and diving spots. If you don't have a copy of the regulations in your state, see the chart in this article and write for one. If your state has no laws, follow the Underwater Society of America's recommendations.

Of course, not only must divers know local regulations regarding diving and the divers flag, they must also educate the people around them. Most specifically, boaters must be educated. The U.S. Coast Guard Auxiliary and U.S. Power Squadron courses help, but they reach only those people who take a course. Many of these people only do so after they have been running their own boats for awhile and have discovered how little they know.

There are other ways to educate boaters and divers and one Canadian scuba club has come up with a good one. It sponsors a project called, "Diver Safety Days." Backed by every club in the province, the event is held in early June, just before the majority of recreational boaters will be once again plying the waters in that particular area.

The Canadian clubs set up booths in various shopping malls, displaying the flag and dive gear and showing slides. Members hand out buttons and flyers to the public. Divers appear on local TV stations to talk about the flag and there are even ads about the flag on TV. The result is that close calls between divers and boaters are reduced.

There is no reason why clubs across the United States could not do the same thing. Increased awareness on everyone's part about the use of the divers flag would make the effort well worthwhile.

All the awareness in the world won't help, however, unless divers get the flag off land and put it back into the water. Know your local rules and regulations and use the flag when it is called for. Don't cut corners. Don't leave the flag on a pier and expect boaters to know you are in the water. Don't display the flag when you are not actually diving.

MANUFACTURERS OF DIVERS FLAGS

Company	Model	Type	Retail Price	Additional Information
Aqua-Craft	A-15	Flag/ stiffener	$ 3.95	14 x 16"
	A-15-2 & A-15-3	Flag	$ 5.50-10.95	20 x 24" & 30 x 36"
	A-52 & A-114	Buoy	$14.25 & 14.95	14 x 16"/stiffener & 20 x 24"
	A-53 & A-115	Inner tube/ strap	$10.25 & 10.95	14 x 16"/stiffener & 20 x 24"
	A-154	Flag	$22.00	30 x 36"
Bayfront	BF144	Flag	$ 2.50	16 x 12"
	BF143	Flag/ stiffener	$ 2.95	16 x 12"
Dacor	NDFL	Flag	$29.00	48 x 62"
	NDFS	Flag	$19.00	30 x 36"
	DSF	Inner tube/ clamp	$12.00	12 x 15"
	IDF1	Inflatable buoy	$ 8.95	8 x 10"
Fentress Marine	SF & MF	Flag/ stiffener	$ 3.50-4.50	12 x 15" & 16 x 20"
	S-3, S-4, S-4J, S-5J, M-4 & M-4J	Cleat mounted	$ 8.95-10.95	Flag from 12 x 15" to 16 x 20"; pole length 3 to 5'; J means joined pole
	SF-4J, SF-5J & MF-5J	Buoy	$12.95-14.95	
	TF-2 & TF-3	Inner tube/ clamp	$ 9.95-10.95	
Global Manufacturing Corporation	349 & 350	Inner tube/ strap	$ 5.95-6.95	14 x 16" & 16 x 20"
	351 & 352	Inner tube/ clamp	$ 9.95-10.95	14 x 16" & 16 x 20"
	353 & 354	Buoy	$10.50-11.50	14 x 16" & 16 x 20"
	355 & 356	Flag/ stiffener	$ 3.50-4.50	14 x 16" & 16 x 20"
	357	Boat flag	$ 8.95	28 x 36"
	358	Flag	$19.95	36 x 45"
Nautek	F114	Flag/ stiffener	$ 3.75	14 x 16"
	F214	Buoy	$11.95	14 x 16"
Pennform	F-1046	Inflatable buoy	$24.98	14 x 16"
Scubapro	40-018-000	Flag	$ 4.00	14 x 14"
	40-019-000	Alpha flag	$ 4.00	14 x 14"
U.S. Divers	7231-04	Flag/ stiffener	$ 4.75	13 x 16"
	7231-30	Inner tube/ clamp	$11.95	13 x 16"
U.S. Nemrod	06931	Inner tube/ clamp	$11.50	14 x 16"

"I WAS DOWN 110 FEET, WHEN I HEARD...

. . . my partner warn me about my bottom time. He was on the support boat, transmitting over his WET-PHONE™ Surface Tender. I had my WET-PHONE transceiver strapped to my arm. To tell you the truth, I'm not crazy about diving alone. But now that I can talk and listen down there, it makes a world of difference. I'm more free to do what I'm paid for.

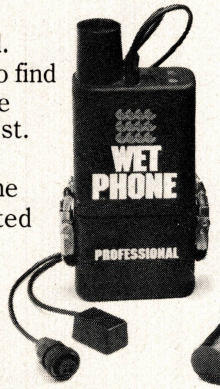
Anyway, I needed at least another 20 minutes to finish the job, so I asked, 'How much time do I have?'

'You're pushin' the tables,' he answered, 'better come up now.'

'Marking the wreck,' I said. It had taken us a long time to find that wreck. I wanted to make sure we could find it again, fast. So I secured my extra WET-BEACON™ to the hull, set the pulse rate to SLOW and started toward the surface.

'Coming up,' I said.

'Roger.' My other WET-BEACON was secured to the anchor line, set on FAST pulse. I scanned for its ultrasonic signal with my WET-FINDER.™



In a few seconds I was homed-in on the beacon. My partner was getting anxious.

'Can you locate the boat?'

'Piece of cake,' I answered. When I surfaced I was five feet from the bow. Bullseye. The next

FILMING THE WRECK,

morning, I went back to the wreck, finished filming, and got ready for another job."

The Professional WET-PHONE.

A lightweight, ultrasonic, system for commercial and military divers. It's portable. It gives you smarter, hands-free communications underwater. It's simple to use, with an in-mask, voice-activated transmission system. It has a normal operating range of about 1/4 mile. Adjustable earphone volume and side tone control give you superb clarity. WET-PHONE helps you do better work, faster work, more work.

The WET-PHONE Surface Tender.

An ultrasonic, wireless system for smarter communications between the support boat and WET-PHONE equipped divers or submersibles. Its range, about 1/4 mile. It has a built-in tape recorder jack, headphone jack, optional rechargeable batteries. It helps make a dive more efficient.

The WET-BEACON/WET-FINDER Electronic Navigation System.

A hand-held relocation system lets you navigate the shortest distance between two points underwater. With far greater accuracy than a compass. WET-FINDER scans for ultrasonic pulses sent out by WET-BEACON within a range of 1,000 feet. A bright LED signal tells you when you're fixed on the beacon. Place WET-BEACON anywhere underwater. WET-FINDER can relocate it as much as four months later.

These solid state systems have been rigorously tested by civilian and military dive teams. With proven dependability they'll put more freedom, profit and safety into any dive operation. For a free demonstration, see your local dive shop.

If unavailable at dive shop, call or write Conquest Marketing Co., Inc., 3176 Pullman St., Suite 110, Costa Mesa, CA 92626. (714) 540-2323. For a full line catalog, send $1.50.

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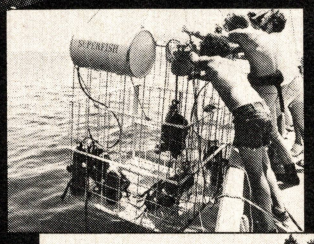

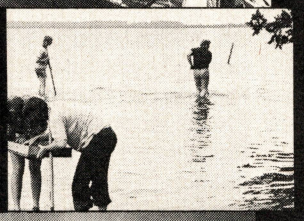

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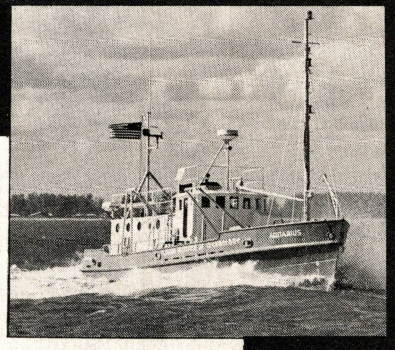
Florida Institute of Technology admits students of any race, color, national or ethnic origin and does not discriminate on the basis of handicap in admission or access to its programs.



Florida Institute of Technology
School of Applied Technology
Office of Admissions
1707 N.E. Indian River Drive
Jensen Beach, FL 33457

Name_____
Address_____
City_____ State_____ Zip_____
Phone_____ Age_____ SDRP 3/79

UNDERWATER FORUM

(Continued from Page 6)

tent divers, we were given the dive plan and our independence. . .

Bring your camera and forget anywhere else you may have dived — this is paradise! Camera rental and instructions are available next door at the Seftons and the Churches (SDM photo editors Jim and Cathy) give classes on the premises in underwater photography.

Overall, I give my unqualified recommendation for the Spanish Bay Reef for a perfect dive vacation.

HAROLD L. GREENE
ENCINO, CA

Basic Compliment

I read the letter entitled "Basic Disasters" in your November '78 U/W Forum with great interest. It just so happens that I was taking a basic scuba course offered by the Nittany Divers at Penn State University. My experience was much difference than that of Thomas Sorenson, and the course exemplified fantastic instruction . . .

We were constantly encouraged by YMCA certified instructor Tim Calvin and his certified training assistants Mark Littel, Tim Glick, John Barthus, Conney Murray and John Wiles. Their comments gave each and every member of the class a feeling of accomplishment. This was coupled by an obvious feeling that our instructor cared.

The check-out dive was the single most enjoyable experience of the term . . . I left the dive site a certified diver knowing that gaining more experience was the route to becoming proficient. Moreover, I left Blue Hole Quarry with a feeling that scuba divers are the nicest people around. This feeling was developed and promoted by the YMCA personnel.

BILL HUGHES
STATE COLLEGE, PA

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Sundown
Deep Sea Diving Co.

February 10, 1978

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of Deep Sea Diving, Inc.
320 - 19th Avenue
Oakland, CA 94601

Captain Mikalow:

I have been wanting to write a letter to you for the past four months. My records show for the past three years 36 graduates from your school have been in my employment.

I wish to compliment you and your instructors on the tremendous job you have been doing by taking novice students and turning them into an excellent and adaptable diving crew. I have been very pleased with their eagerness to further learn and adjust to our individual needs.

If I may suggest, I would have had employment for more graduates if they would have had their own hard-hat gear as some of our contracts are being subcontracted to different areas. When we split our gear in different ways, we are caught short.

If I had any complaint whatsoever, it would be the student's personal appearance that does not fit with the clientele they are working for.

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SD-39

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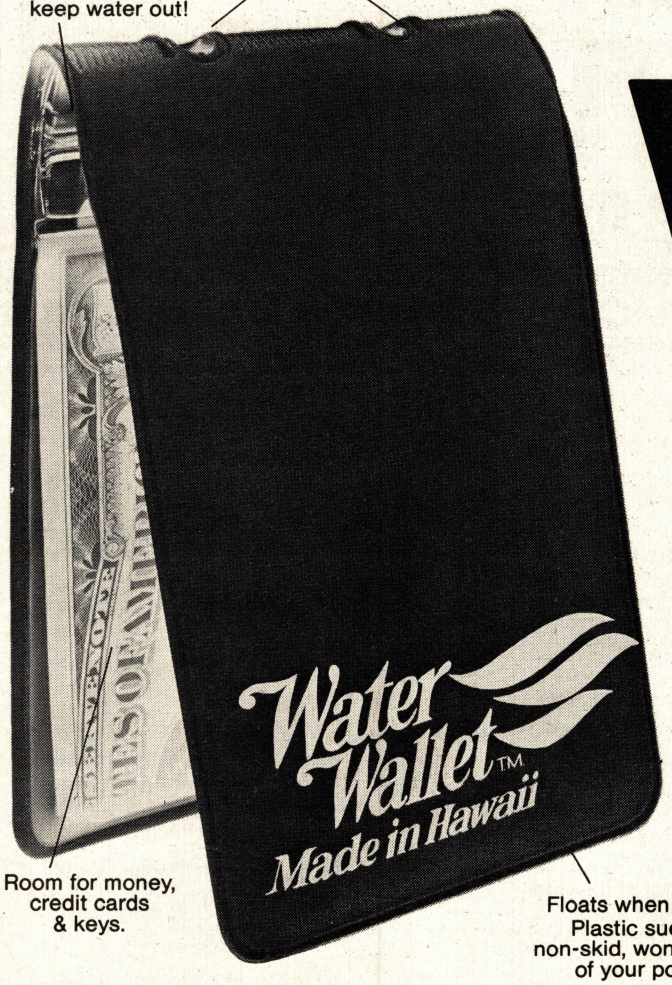

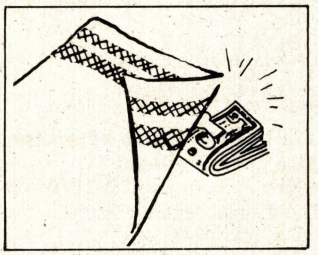

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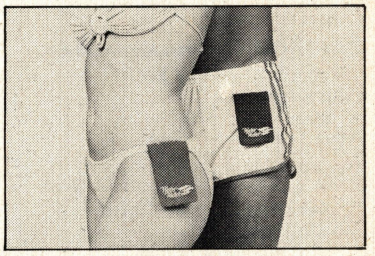

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Contact: Robert

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"Diving for Fun and Profit" Film Show
March 21, 1979
Aqua Tech Dive Center
1717 Yosemite Blvd.
Modesto, CA 95351
(209) 577-DIVE, Contact: J. Dean

"L'Aventure Cousteau" with Bill McDonald
May 26, 1979

Anniversary Celebration Party
May 26 & 27, 1979
Cassotta Diving
4930 Pacific St.
Rocklin, CA 95677
(916) 624-0422, Contact: David

"Dive to Adventure" with Jack McKenney
May 19, 1979
Divers Den, Inc.
22 Anacapa St.
Santa Barbara, CA 93101
(805) 963-8917
Contact: Betsy Hazelet

"Dive to Adventure" with Jack McKenney
April 21, 1979
(Proceeds to Pacific Grove Rescue Unit Chamber)

"Monterey Underwater Treasure Hunt"
April 22, 1979
Monterey Dive Center
763 Lighthouse Ave.
Monterey, CA 93940
(408) 375-6363, Contact: Richard

COLORADO

"1st Annual Mile-High Underwater Photo Contest"
Entry deadline: May 25, 1979
Colorado Divers World
557 Milwaukee St.
Denver, CO 80206
(303) 333-6303
Contact: Tom Edward

CONNECTICUT

"New England Wreck Diving" with Capt. Bill Palmer
March 8, 1979

"Introduction to Commercial Diving" Seminar
April 12, 1979
Innerspace Diving Supply
598 Center St.
Manchester, CT 06040
(203) 646-2352, Contact: Carl

FLORIDA

"Shell Collecting Derby"
May 29 & August 26, 1979

"2nd Annual Treasure Hunt"
July 22, 1979

Spearfishing Programs
March 25, April 29, June 10, July 8, & August 12, 1979
Divers Den South
12614 N. Kendall Dr.
Miami, FL 33186
(305) 595-2010, Contact: Terry

"Dive to Adventure" with Jack McKenney
March 9, 1979
Divers Unlimited
4231 Hollywood Blvd.
Hollywood, FL 33021
(305) 981-0156, Contact: Henry

"Diving Fashion '79" Fashion Show and Wine/Cheese Party
March 28, 1979

"An Evening of Jack McKenney's Films"
April 25, 1979

"Diving Travel" Film Presentation
May 2, 1979
Lauderdale Diver
1334 S.E. 17th St.
Ft. Lauderdale, FL 33316
(305) 467-2822, Contact: Scotty

GEORGIA

"3rd Annual Underwater Film Festival" Featuring Jack McKenney
May 26, 1979
Sub-Aqua Specialties
2236 Bemis Road
Valdosta, GA 31601
(800) 342-7156 GA
(800) 841-4443 U.S.
Contact: Alan Beuscher

ILLINOIS

"April Fest Film Show"
April 7, 1979
Berry Scubatech
12003 S. Cicero
Alsip, IL 60658
(312) 371-3366, Contact: Joseph

MARYLAND

"Annual Oyster Chase" Celebration and Film Show
March 30 - April 1, 1979
Dynamo, Inc.
8906 Rhode Island Ave.
College Park, MD 20740
(301) 474-6380
Contact: Fred Thompson

NEW HAMPSHIRE

"18th Annual Slush Dive"
Late March, 1979
LaPorte's Skin Diving Shop
Box 53, Route 103
Newbury, NH 03255
(603) 763-5353, Contact: J. LaPorte

NEW MEXICO

"Dive to Adventure" with Jack McKenney
March 4, 1979
Albuquerque Divers Den
1228-B Juan Tabo N.E.
Albuquerque, NM 87112
(505) 294-1886, Contact: Anthony

NEW YORK

"Dive to Adventure" with Jack McKenney
February 25, 1979
Niagara Scuba Sports
2048 Niagara St.
Buffalo, NY 14207
(716) 875-6529, Contact: Dave

NORTH CAROLINA

"Charlotte's 1st Annual Underwater Photo Show"
May 12, 1979
Scuba World, Inc.
4732 South Boulevard
Charlotte, NC 28210
(704) 523-1657, Contact: J. Hanig

OHIO

"Open House" '79 New Gear and Slide Show
March 10, 1979

"Intro. to Scuba Diving Clinic" Fund Raiser for PBS Channel 30
May 20, 1979
Divers Paradise
2511 N. Reynolds Rd.
Toledo, OH 43615
(419) 535-6828, Contact: Eldin

OREGON

"Dive to Adventure" with Jack McKenney
May 4 & 5, 1979
(Salem & Eugene)
Oregon Diving School, Inc.
1790 Center N.E.
Salem, OR 97321
(503) 363-1731, Contact: Owen

TEXAS

"Our Planet Ocean Festival" Featuring Jack McKenney
March 10, 1979
Aqua-Trek, Inc.
804 University Blvd.
Galveston, TX 77550
(713) 763-0456, Contact: Jinks

"Sun Country Underwater Film Festival" Featuring Jack McKenney
March 3, 1979

"1st Annual Elephant Butte Treasure Hunt"
May 5 & 6, 1979
South West Scuba Divers
1665 Lomaland Dr.
El Paso, TX 79935
(915) 593-0250
Contact: P. Godbold

CANADA

"An Evening with PADI's New Training System" Featuring Dennis Graver, PADI Training Director
July 7, 1979
Supreme Divers/Canada Scuba Schools
4164 Kingston Rd.
Scarborough, Ont. M1E 2M6
(416) 282-7938
Contact: A. Lambert

VIRGIN ISLANDS

"Easter Underwater Treasure Hunt"
April 15, 1979

"Virgin Islands Carnival Week Underwater Photo Contest"
Entry deadline:
April 27, 1979
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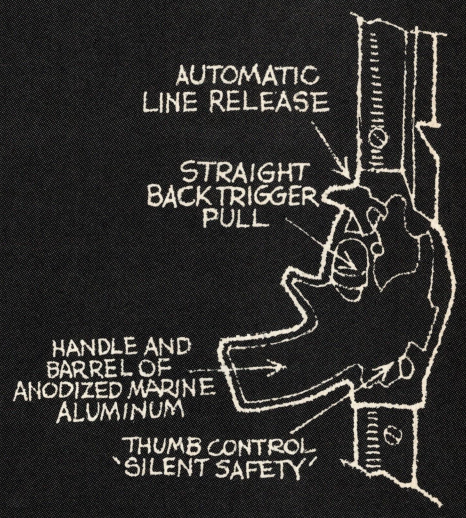


Category: Spearfishing Safety

By Dennis Graver

Spearguns and spears are dangerous weapons. Their misuse can turn fun into tragedy. Those who hunt fish must be aware of certain precautions for their own safety and the safety of others. Test your knowledge of spearfishing safety by answering these questions. Answers are on the following page.

1. A speargun should be cocked:
- ☐ A. Before entering the water and uncocked before exiting
- ☐ B. After entering the water and uncocked after exiting
- ☐ C. After entering the water and uncocked before exiting
- ☐ D. Before entering the water and uncocked after exiting

2. Which of the following is *not* a recommended safety practice for spearfishing equipment:
- ☐ A. Keep speartips covered when not in use
- ☐ B. Unscrew and remove fixed speartips when not in use
- ☐ C. Dismantle break-away speartips when not in use
- ☐ D. All of the above practices are desirable

3. Which of the following statements about spearguns is false:
- ☐ A. Deteriorated sling rubbers should be replaced
- ☐ B. Practice shooting above water before shooting underwater
- ☐ C. The strength of sling rubbers must be limited
- ☐ D. The clearer the water, the bigger the gun that may be used

4. When entering the water from a height of several feet to go spearfishing, a diver should:
- ☐ A. Hold the spear out to the side with the tip pointed upward
- ☐ B. Hold the spear out to the side with the tip pointed downward
- ☐ C. Tie the spear on a line and lower it into the water before entering
- ☐ D. Have someone hand you the spear after you enter

5. Which of the following statements is false? A spear should be pointed:
- ☐ A. Toward the bottom when at the surface
- ☐ B. Downward for storage
- ☐ C. Away from people at all times
- ☐ D. Upward except when shooting

6. A scuba diver holds his breath while stalking a fish. A similar dangerous practice is:
- ☐ A. A skin diver who hyperventilates excessively before a dive
- ☐ B. A scuba diver underwater holding his breath while cocking a speargun
- ☐ C. A skin diver who breathes from scuba underwater and holds his breath during ascent
- ☐ D. Both B and C, but not A

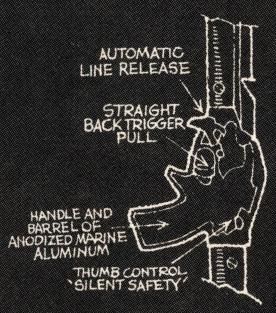
7. Spears are commonly attached to spearguns with a line. Select the *incorrect* statement. Entanglement with speargun line can be avoided by:
- ☐ A. Using no more line than is necessary
- ☐ B. Knowing where the line is at all times
- ☐ C. Having a sharp knife instantly available
- ☐ D. Keeping the line gathered together after each shot

8. A diver should not shoot a spear beyond the limit of visibility. If this could occur, the diver should, if possible:
- ☐ A. Shoot only toward the bottom
- ☐ B. Reduce the power of the gun
- ☐ C. Make certain to hit the target
- ☐ D. All of the above are correct

9. Speared fish should be removed from the water quickly to:
- ☐ A. Prevent scaring other fish
- ☐ B. Keep from attracting predators
- ☐ C. Assure the best fish flavor
- ☐ D. A and B, but not C

10. Which of the following statements is true?
- ☐ A. It is safer to spearfish alone than with a buddy
- ☐ B. One diver should spearfish and the buddy should only observe
- ☐ C. A person spearfishing should have a buddy within sight at all times
- ☐ D. Large animals will be frightened away by shooting them

SDM SCUBA QUIZ



Answers: Spearfishing Safety

1. C. After entering the water and uncocked before exiting.
A speargun is designed to work in water, which is 900 times denser than air. Have a speargun armed only in the environment where it is intended to be used.

2. D. All of the above practices are desirable.
Some method to prevent damage from a sharp speartip is necessary. Even if the tip is removed, use caution with the spear, because even the blunt end can cause an injury. Store spears with the tips pointed downward.

3. B. Practice shooting above water before shooting underwater.
A spear and speargun do not perform the same in air as underwater, and injury is possible. Practice shooting into a sand bottom underwater or at homemade targets suspended in mid-water.

4. D. Have someone hand you the spear after you enter.
There are practical as well as safety reasons for this technique. Frequently you may need to adjust some gear after entering and it is much easier if you have both hands available for any adjustments.

5. D. Upward except when shooting.
With a spear pointed upward at the surface, you might poke a hole in your float or in another diver; and keeping it pointed upward underwater is not practical.

6. D. Both B and C, but not A.
Scuba diving and breath-holding can result in a lung overexpansion accident — a serious injury. Divers have ruptured their lungs by holding their breath while cocking a gun underwater and by taking a breath of compressed air underwater while skin diving and then ascending. Don't hold your breath when breathing from scuba.

7. C. Having a sharp knife instantly available.
Having a sharp knife is a good idea, but this will not prevent line entanglement. Prevention is always better than a method of cure. Be careful with speargun line in the water.

8. B. Reduce the power of the gun.
Select your equipment to match the typical conditions in which you dive. Shooting a very powerful gun into the bottom or into rocks is not advisable. As the visibility decreases, so should the power of the equipment being used.

9. B. Keep from attracting predators.
The scaring of other fish occurs at the time of spearing, not after the fish has died. Keeping bleeding fish in the water can attract trouble. You should not carry speared fish with you while diving.

10. C. A person spearfishing should have a buddy within sight at all times.
A buddy may scare fish or get the one you're after, but can be invaluable should a problem arise. Things can get out of hand when spearfishing and a buddy is essential. Also, don't spear sharks or other large creatures.

Did you answer all the questions correctly? Much of spearfishing safety is common sense, but a great deal can be learned about the subject from a professional. Specialty training in spearfishing is recommended to increase your enjoyment and safety. Courses are offered in many areas.

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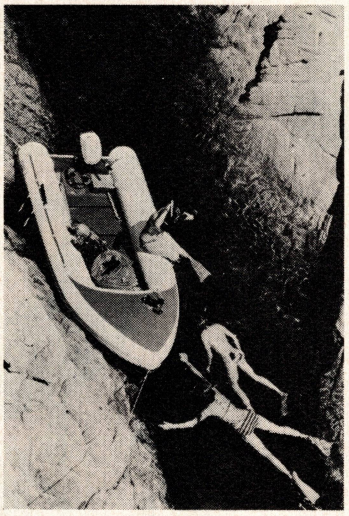

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Shows 'n Events

March 6, 13, 20 Inner Space seminars, sponsored by Hart House UW Club, Music Room of Hart House, Univ. of Toronto, speakers: Dr. George Harpur, Dr. Lee Somers, David Doubilet (Contact: Sandy Brown, 175 Fulton Ave., Toronto, Ont., M4K 1Y2, Canada)

March 10 Sea Rovers '79/Boston Sea Rovers 25th Annual U/W Clinic, Boston Univ. & John Hancock Hall (Contact: Bunky Hodge, 74 Beech St., Rockland, MA 02370, phone 607-878-8710)

March 17-18 Man & the Sea Conference III, supported by Temple Univ.-Oceanic Society, Philadelphia Maritime Marine (Contact: Dr. Robert Leahy, U/W Education & Research, Temple Univ., Philadelphia, PA 19122, phone 215-787-8720)

April 2 Entry deadline Ken Read Memorial Photo Contest (Contact: Alan Budreau, Box 182, Arlington, MA 02174 617-369-8649)

April 21 NAUI Underwater '79, Underwater Symposium, Harvard Univ., Cambridge, MA noon-6 pm (Contact: Fred Calhoun, PO Box 291, Back Bay Annex, Boston, MA 02117)

April 21 25th Underwater Film Review, John Hancock Hall, Boston, MA 8 pm (Contact: Fred Calhoun, PO Box 291 Back Bay Annex, Boston, MA 02117)

April 25 Photo contest deadline/Seaspace '79 (Contact: Dick Zingula, PO Box 4362, Houston, TX 77210)

May 19-20 Seaspace '79, University Center Bldg., Univ. of Houston, 9 am-5 pm (Contact: Dick Zingula, PO Box 4362, Houston, TX 77210)

PRICE TO MARES USA

Mares USA has announced the appointment of Dell Price as Manager of Marketing. Mares is the newest full line dive equipment manufacturer to enter the North American market. Based in San Diego, California, the company is headed by Charles Jehle.

Price, who formerly headed the merchandising management team for Voit Swimaster and Waterskiis, will oversee the coordination and sales of the Mares USA line. A past vice-president of DEMA and a diver for 16 years, Dell brings a wealth of domestic industry experience to one of Europe's oldest and largest diving equipment manufacturers. Interested dealers may contact him for information about the new product line at Mares USA, 722 Genevieve St., Solana Beach, CA 92075 or phone (714) 481-8877.

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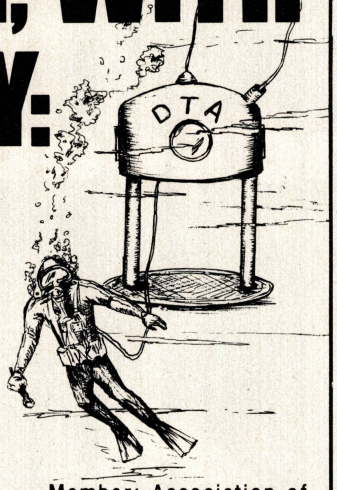

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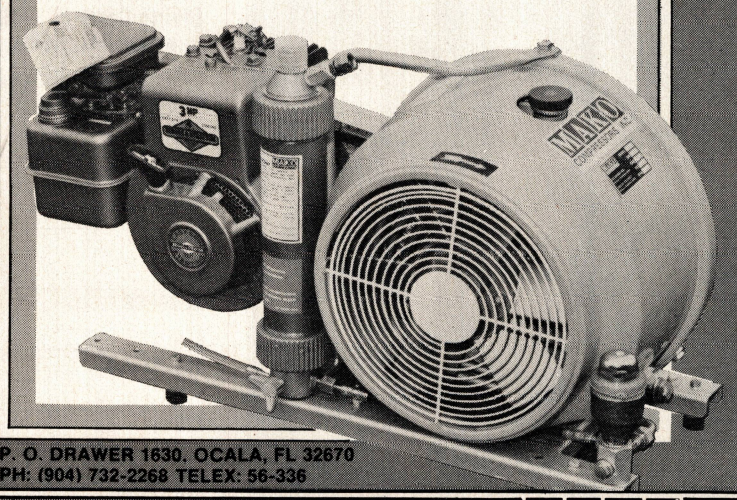

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GEIGER BACK FROM CAICOS

Gary Geiger, noted underwater photographer, PADI Master Instructor and tour organizer, recently returned from two weeks of intensive underwater photography work at South Caicos, West Indies. A well known diving personality in the St. Louis, Missouri area, Gary led two

consecutive groups of avid U/W photographers to the virgin reefs and drop-offs surrounding South Caicos.

Using the Admiral's Arms Inn as their base, Gary and his fellow enthusiasts daily visited "some of the most exciting and breathtaking underwater sights ever filmed." The recipient of numerous photo awards, Gary described the results of his two week experience as "fantastic."

Individuals desiring to accompany Gary on his future underwater photography tours should contact: Gary Geiger, 10132 Buffton, St. Louis, MO 63123.

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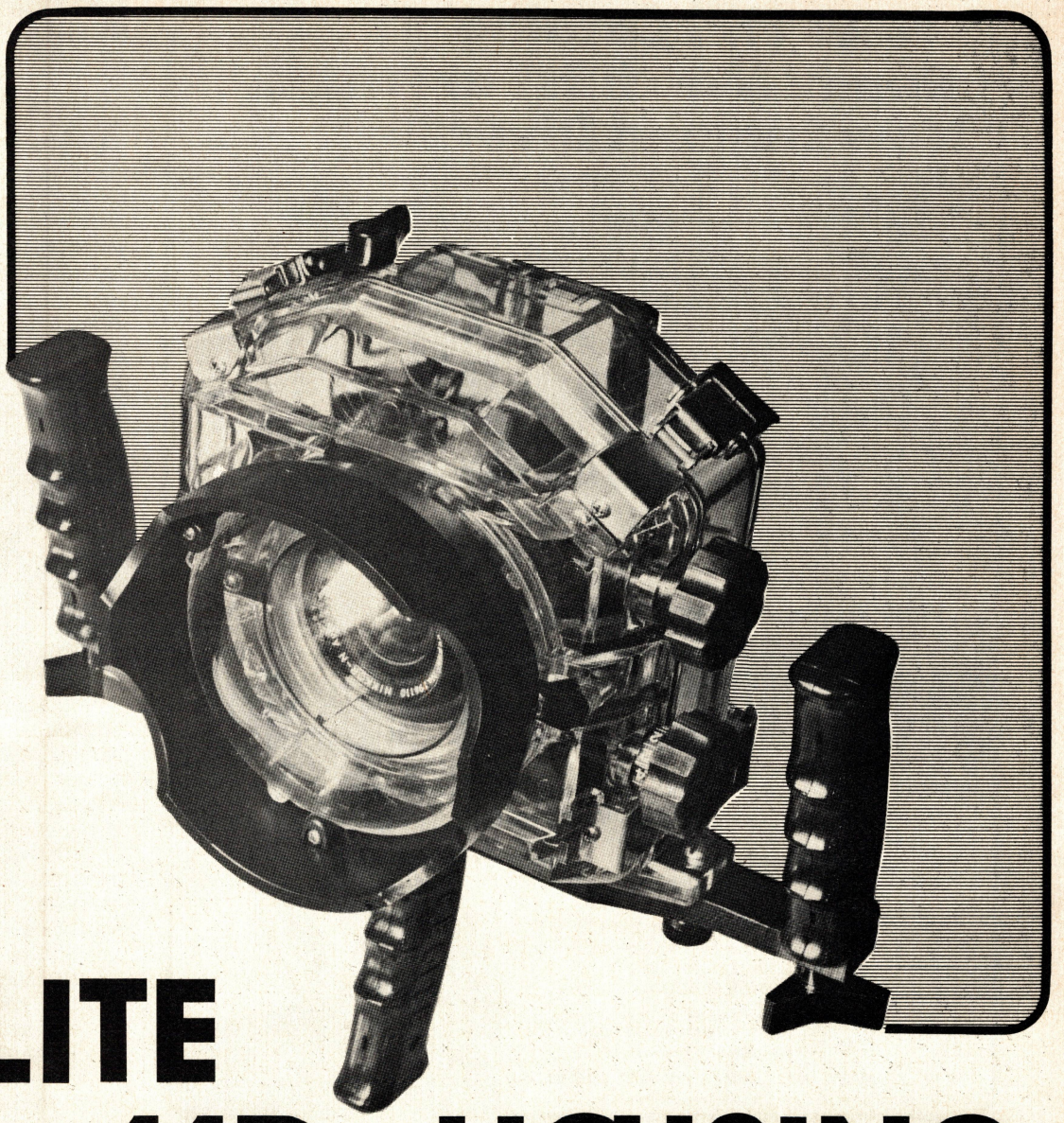

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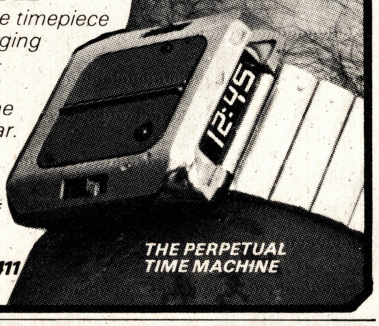

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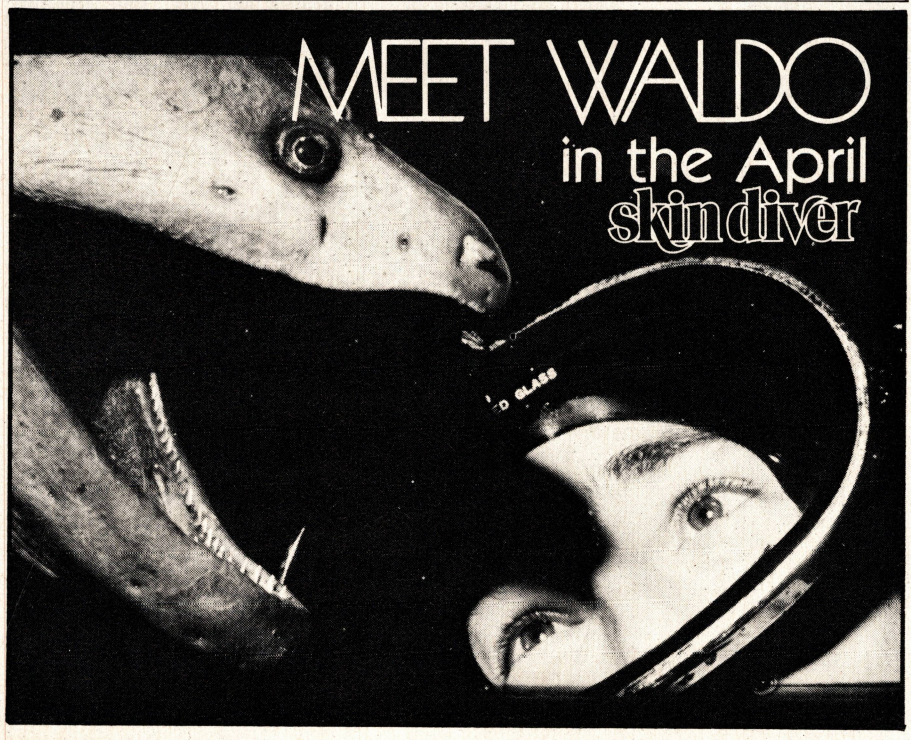

SCUBA CHROME LABS

Underwater photographers now have their own custom lab service and organization. Scuba Chrome International is a worldwide association of serious underwater photographers. Created by Scuba Chrome Labs to help promote excellence in and enjoyment of underwater

photography, the membership is open to all pros and serious amateurs. A bimonthly newsletter is published containing tips from working pros, markets for underwater photography, travel articles of interest to photographers, and uses for underwater photos. Editorial director of the newsletter is Burton McNeely, a 25 year veteran whose work has appeared in many national magazines and ad campaigns over the years.

A traveling salon featuring outstanding work by members is made available to film festivals, trade shows and dealers to give these talented artists the exposure they deserve and to help promote excellence in all phases of underwater photography. Members receive a 10 percent discount on all lab services from Scuba Chrome Labs in addition to attractive print offers during the year.

Dues are $15 per year plus $5 initiation for the first year. A membership card and vinyl decals are provided for camera housings and luggage. Sample newsletters and descriptive folders are available for $2 from Scuba Chrome, 4911-W. Grace St., Tampa, FL 33607.

RICHARDSON JOINS LUCAS & ASSOC.

Jim Lucas, president of Jim Lucas & Associates, has announced the appointment of Anzie Richardson as office manager. Anzie is a certified diver with an extensive background in retail sales and is familiar with all aspects of diving equipment. She will be in the office daily to receive orders and solve any problems.

Jim Lucas & Associates represents Sportsways, Sea Suits, Dolt Bags, Pelican Products, Time Unlimited Watches and Div-Ak in the Southeast United States. The group also represents Sea-Quest in Florida.

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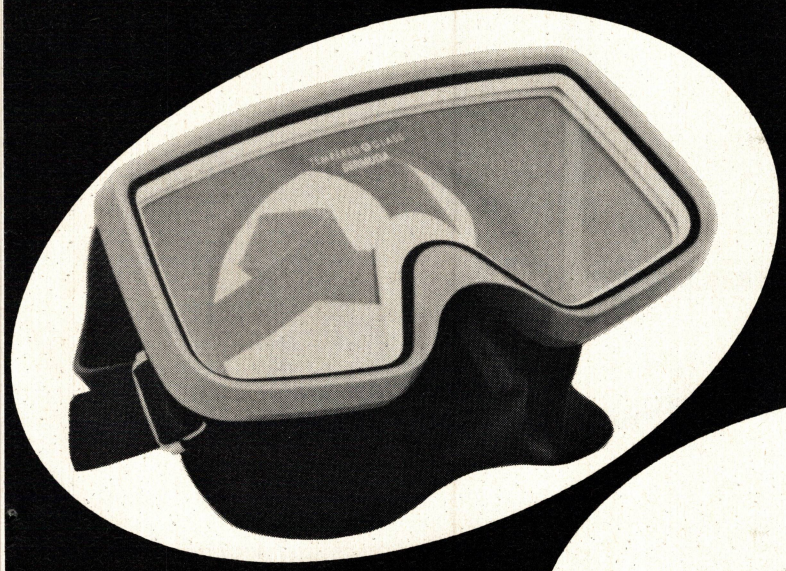

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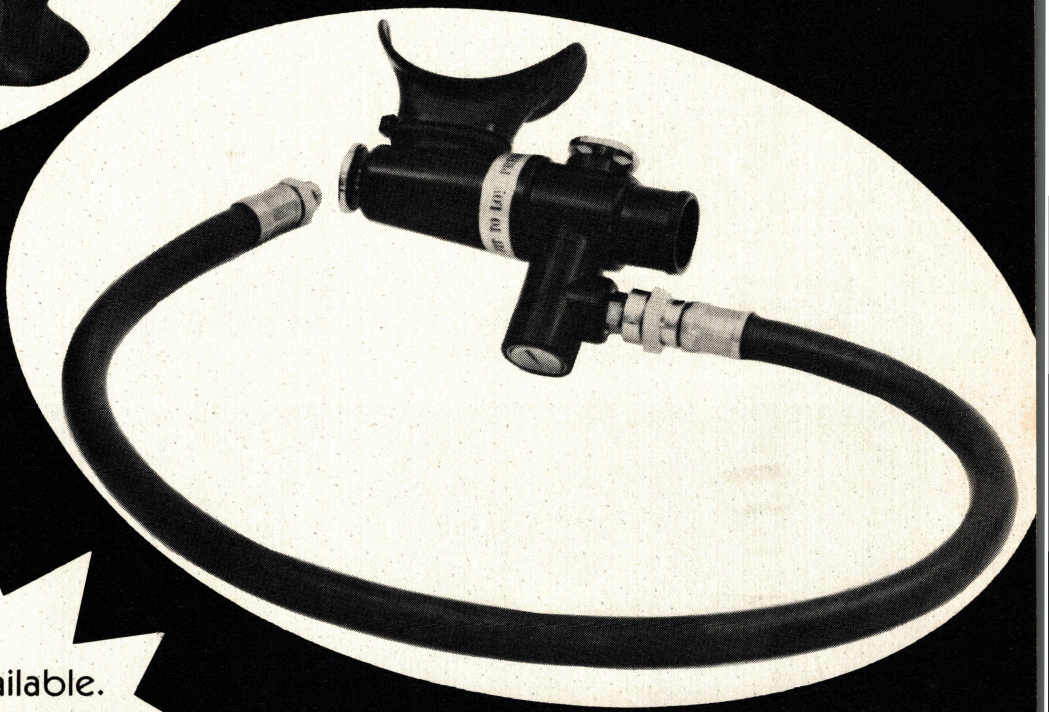

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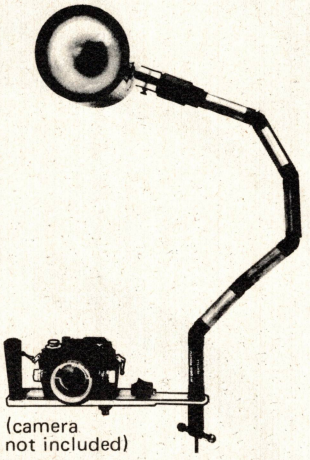

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PADI BUSINESS SEMINARS

PADI has announced the 1979 schedule of its Dive Business Seminar Series. The new three day programs will be hosted by Al Hornsby, PADI Training Facility Director. Al's seminars in 1978 attracted over 400 dive retailers and were received with great enthusiasm across the country. Featured speakers for 1979 will be Mr. James C. Bigler and Commander Jim Williams.

Bigler, a successful Denver businessman with retail offices worldwide, is a PADI Instructor and vice-president of PADI International College, San Diego, CA. His presentations bring a "How To" approach to the dive business. At PADI International College, he is the director of the Retail Dive Store Operations and Management Course. His numerous proven study guides, information sheets, and work check lists will be available for all participants.

Commander Williams, president of PADI International College, brings with him a long history of dive industry knowledge. As a PADI Master Instructor, Instructor Training Course Director, and retail dive store owner, he is greatly respected within the industry and is a catalyst for exciting, successful, and profitable teaching techniques.

Program topics will include: Sales Presentations — How to Do It, Telephonemanship in Sales, Never Lose a Customer — Keep them All Diving, Your Three Most Important Partners in the Diving Retail Business, Common Tax Problems — Some Solutions, Paperwork, Inventory Control Methodology, Profits from the Independent Instructor/Dive Store Relationship, and more.

The 1979 seminar schedule is as follows:

Seattle, WA	April 24, 25, 26
San Francisco, CA	May 17, 18, 19
Columbus, OH	September 12, 13, 14
Boston, MA	September 16, 17, 18
Syracuse, NY	September 20, 21, 22
Chicago, IL	October 17, 18, 19
Cherry Hill, NJ	October 21, 22, 23
Charlotte, NC	October 25, 26, 27
Houston, TX	November 11, 12, 13
Memphis, TN	November 15, 16, 17
Orlando, FL	November 19, 20, 21
Honolulu, HI	February, 1980

Since a large number of last year's attendants have already made advance reservations, 1979 openings are limited. All dive store owners, employees, and instructors wishing to increase profits and know-how should write for reservations and information as soon as possible. Contact Al Hornsby, PADI Training Facility Director, 2064 N. Bush Street, Santa Ana, CA 92706.

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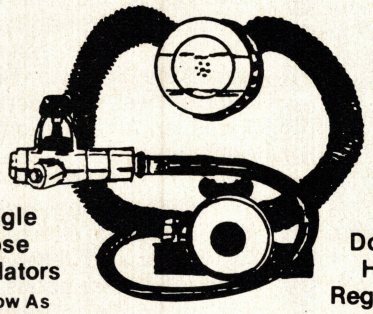

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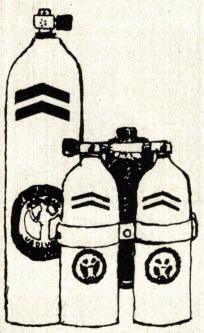

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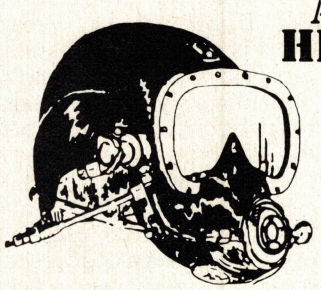

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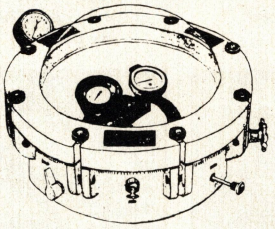

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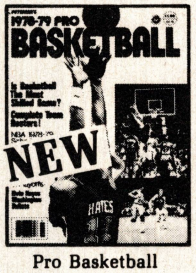

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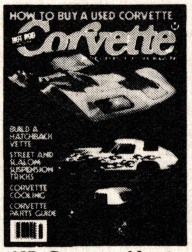

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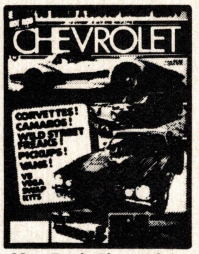

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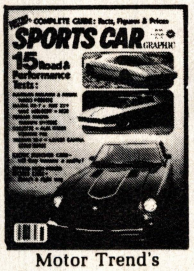

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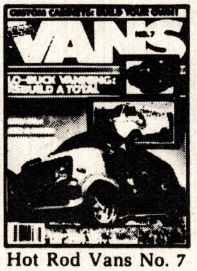

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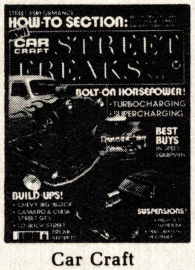

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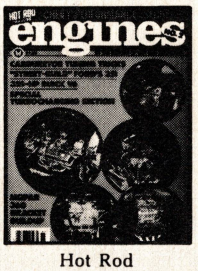

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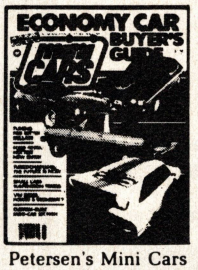

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SPANISH GALLEON FOUND

Seaquest International, Inc., a U.S. corporation based in Chicago, in close cooperation with the Dominican Republic, has succeeded in locating the wreck of one of the most sought after treasure galleons ever lost in the New World. The *Nuestra Senora de la Limpia y Pura Concepcion* (Our Lady of the Good and Pure Conception) sank in 1641 carrying a considerable portion of the Spanish royal revenues for the years 1640 and 1641.

Sunk on the Silver Bank in what is now Dominican waters some 65 miles northeast of the Dominican Republic, the *Concepcion* was salvaged first by William Phips, an American shipwright and adventurer in 1687.

Phips could not penetrate the coral shield which he believed held the bulk of the *Concepcion's* treasures but nonetheless managed to retrieve some 32 tons of silver and other goods, enough to earn him a knighthood and the governorship of the Massachusetts colony.

Phips knew he had missed the majority of the treasure aboard the wreck and in 1688 returned with a second recovery expedition, only to be disappointed once more in his efforts to overcome the obstacles he had previously encountered.

Speaking for Seaquest International, Burt D. Webber, Jr., president, said, "This is a victory of determination, first rate historical research and state-of-the-art technology. We've invested a great deal of money over a long period of time. We sought and received the best advice of many experts."

Webber cited in particular marine historian Goin E. "Jack" Haskins whose six years of painstaking research culminated in his discovery last spring of the logbook of the ship *Henry* which discovered the wreck of the *Concepcion* 46 years after its sinking.

The log provided compass bearings which enabled Webber to employ his specially developed search techniques to locate the wreck in late November after less than a week of searching the Silver Bank reef complex.

The expedition, named Operation Phips II, has retrieved numerous artifacts that promise to make the wreck of the *Concepcion* one of the richest cultural repositories ever recovered from New World waters. Among these are cannon balls, porcelain cups and plates from Mexico and China, olive jars, candlestick holders, a silver candle snuffer in nearly perfect condition, as well as a significant quantity of silver coins, principally pieces of eight minted in Mexico and Peru.

Seaquest officials declined comment on the amount of silver thus far salvaged but predicted it will probably take Webber's expedition another five to six months to complete the recovery.

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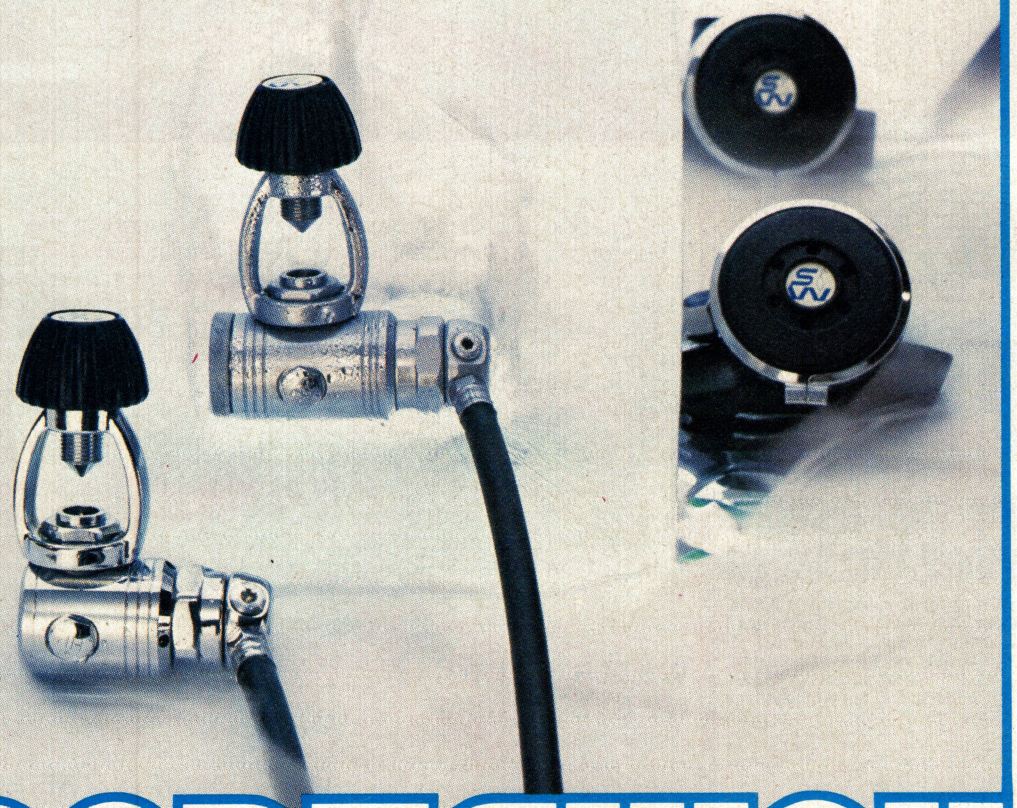

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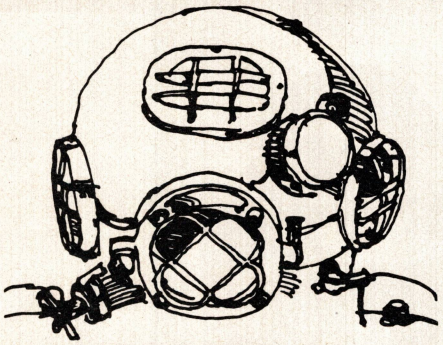

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'Film Festivals 'n Symposiums

UPS FILM COMPETITION

The Northern California chapter of the Underwater Photographic Society will hold an underwater photo competition for both amateur and professional photographers. There are two divisions: "Open" for those who have taken 1st, 2nd, or 3rd place awards in major competition, and "Novice" for first time entrants and those who have never won photographic awards before.

Categories for the competition are: color prints close-up, color prints non close-up, black & white prints, color slides close-up, color slides non close-up, and motion pictures. Deadline for entry is April 20, 1979; judging will be held on April 22. The award winning prints and slides will be exhibited the night of the festival at the Oakland Paramount Theater of the Arts, Oakland, CA.

For information and entry blanks write: Underwater Photographic Society, % Rich Bergero, 22430 Thunderbird Place, Hayward, CA 94545.

WATERMAN TO NY SYMPOSIUM

Stan Waterman will headline an afternoon and evening symposium entitled "Your Future in the Sea" at the American Museum of Natural History, New York City, Saturday, March 24, 1979. The program will be the ninth undersea symposium in New York sponsored by the American Littoral Society.

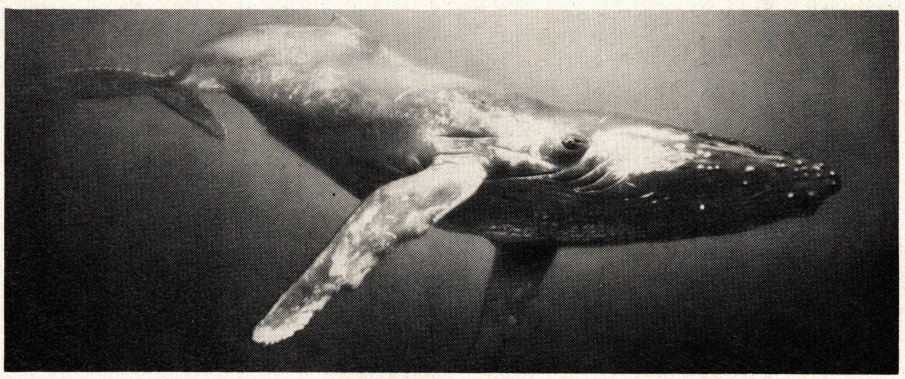
The program will also include Dr. Eugenie Clark, who will discuss her recent work on phosphorescent fishes in the Red Sea. Mike DeCamp's classic film study of Weddell seals and the imaginative films of Robin Lehman will be shown.

The symposium runs from 1-5 p.m. and 8-11 p.m. For information and tickets write: American Littoral Society, Highlands, New Jersey 07732. Or phone (201) 291-0055.

NAUI CONFERENCE

The NAUI Canada Underwater Conference Sub-Aquatique will be held at the Vancouver Aquatic Centre on the weekend of April 20th-22nd, 1979. The theme of the conference is Invitation to Inner Space. The Aquatic Centre will house a variety of activities designed to inform and entertain the diving community.

There will be underwater photo seminars both in the pool for beginners and in the ocean for experienced photographers. There will also be opportunities to try the latest in dive equipment and a chance for divers to test their strength against fitness and strength measuring devices. For the neophyte there will be several NAUI introductory courses.



Throughout the center there will be seminars in equipment troubleshooting, seafood cooking and collecting and a training course for the NAUI E.S.P. (Equipment Safety Program). On the beach next to the Aquatic Centre there will be ocean rescue and emergency procedures seminars and instruction on the operation of a one-person submersible. About town there will be tours of the world famous Vancouver Aquarium and of the Hyperbaric Treatment Centre.

Following the conference there will be several opportunities to dive the spectacular waters of British Columbia, including overnight boat charters to the Gulf Islands.

For information contact: NAUI Canada, Box 510, Etobicoke, Ontario M9C 4V5.

MAN IN THE SEA

The 1979 Man in the Sea symposium will be held March 17 and 18 at Pacific Science Center in Seattle, Washington.

The international photo competition is an important part of this event. Each year, however, several hundred excellent competition slides that receive an honorable mention cannot be shown to symposium attendants due to time limitations. This year these slides will be used as "mood setters" before and between sessions of the regular program. The "mood setters" will be shown with no narrative, just a gentle music background.

The symposium is usually a sell out so get your tickets in advance by writing to:

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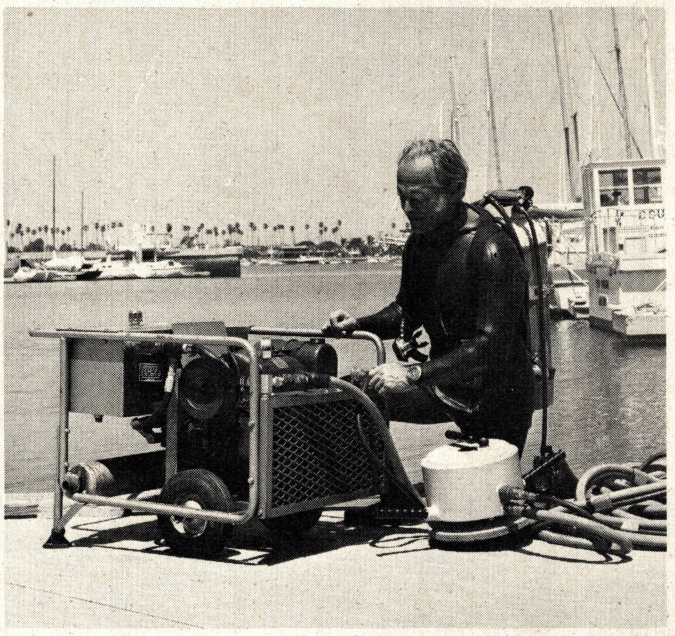

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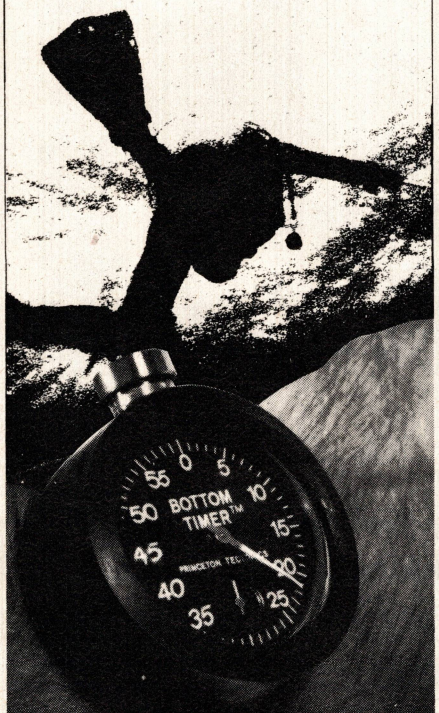

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FILM FESTIVALS

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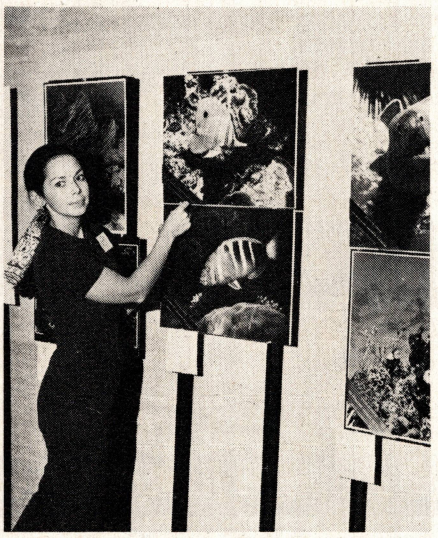
SEASPACE 79

A two day educational dive symposium, international U/W photographic contest and film festival, Seaspace 79, will be held on May 19 and 20 at Jones Hall for the Performing Arts in Houston.

Sponsored by the Houston Underwater Club, the event is designed to further diver awareness and to provide funds for ocean-related scholarships for deserving students.

Deadline for photo contest entries is



April 25. Judging will take place on April 28, and all prints entered in the contest will be displayed during the film festival on May 19.

Awards for the photo contest have been specially designed by artist Robert L. Straight, creator of the unique and highly coveted awards for past Seaspace contests.

For photo contest entry blanks or other information, contact: Dick Zingula, Houston U/W Club, P.O. Box 4362, Houston, Texas 77210.

SEA TURTLE FILM

Caguama, the Mexican fisherman's name for the Pacific green turtle, is the title of a new 16mm film produced by Rich Lang and Ted Rulison.

Filming of *Caguama* took place during a California Academy of Sciences expedition aboard Richard Adcock's *Marisla II* to the Sea of Cortez. The purpose of the trip was to collect live fish for the Steinhart Aquarium in San Francisco and for San Diego's Sea World.

The film records the scientists' fish-collecting techniques and also shows the activities of a cooperative of Mexican turtle fishermen encountered during the trip. The mutual struggle for survival by

the Pacific green turtles and the Mexican fishermen who hunt them is graphically documented.

The film is narrated by Rich Lang, with a Spanish language version narrated by Ramon Bravo. It also features an original musical score, written and performed by Dirk Lang.

Caguama has been an exhibit film at both Northern California UPS and San Diego U/W film festivals. Running time is 25 minutes. For information regarding rental or purchase of the film contact: Ted Rulison, 3063 Cambridge Road, Shingle Springs, CA 95682.

LA MER PRESENTS THE RED SEA

La Mer Tours has recently begun a traveler's film series entitled "Evenings at the Red Sea," The program is a must for anyone who has even remotely considered diving in the Red Sea. The stunning photographs will give viewers a

taste of what La Mer considers to be not just a trip, but an experience.

The La Mer tour offers the best dive sites, many of them not offered on other dive itineraries, beach and desert camping, safaris, four-star hotel accommodations, and an opportunity to behold this remarkable land and its people.

For information on "Evenings at the Red Sea" and/or La Mer's Red Sea Dive Safari, contact: La Mer Tours, 453 F.D.R. Drive, New York, NY 10022.

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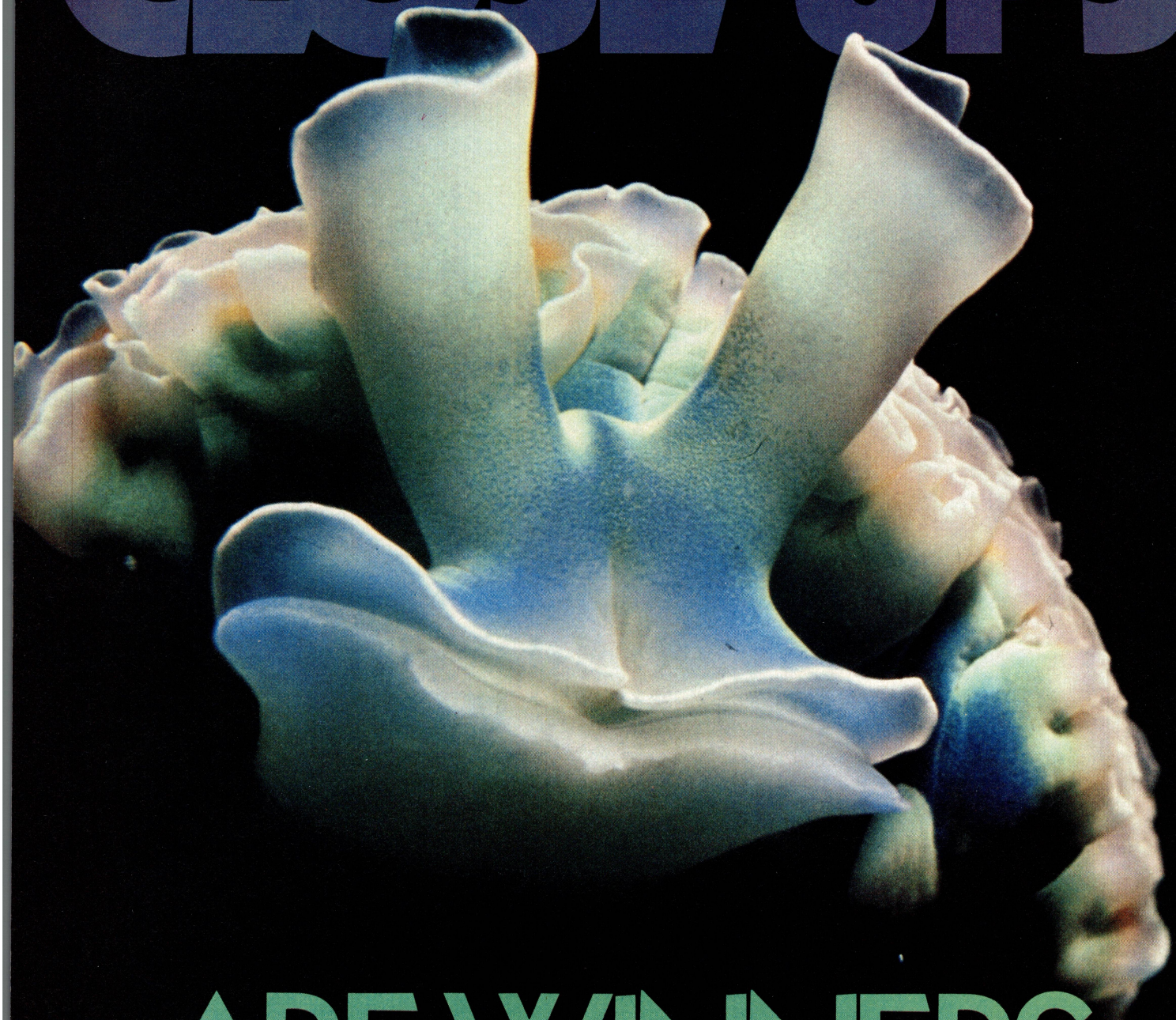
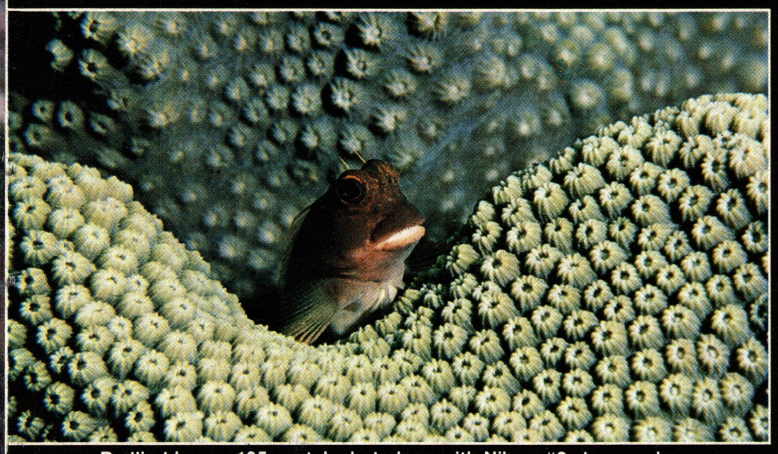


ARE WINNERS

Text and Photography by Jim and Cathy Church

Nudibranch (cropped duplicate slide): Nikonos with 1:1 extension tube.

Using a Nikonos, Micro Lens III, Kramer Framer and Sunpack Marine 28 strobe.

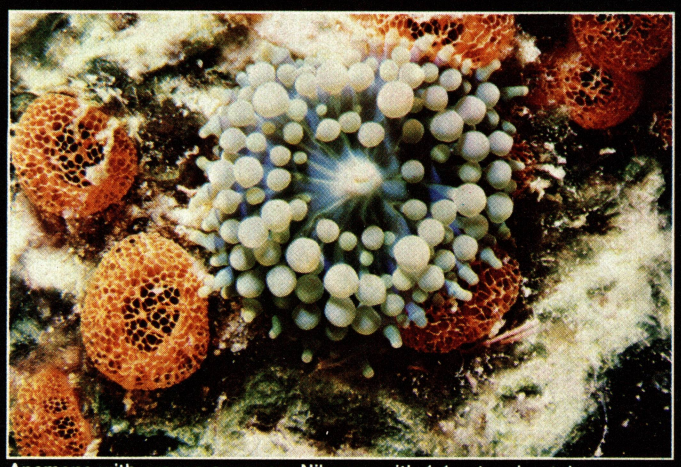


Redlip blenny: 105mm telephoto lens with Nikon #2 close-up lens.

If you want sparkling colors and crisp details in your U/W pictures, take close-ups. Small subjects are often more plentiful, and they lend themselves more easily to underwater photography than many larger subjects. Given a stationary subject, such as an anemone or coral formation, you can gently settle on the bottom and take all the time needed to adjust the camera and lighting angles. Dive shops often stock a variety of supplementary close-up lenses which can be placed in front of the regular Nikonos 35mm lens to reduce focused distance to about two feet or less. If you have a 28mm Nikonos lens, be sure to choose a close-up lens (such as the Hydro Photo 12-28) which was designed to be used with it. Otherwise, the close-up lens mount may show in the corners of your pictures.

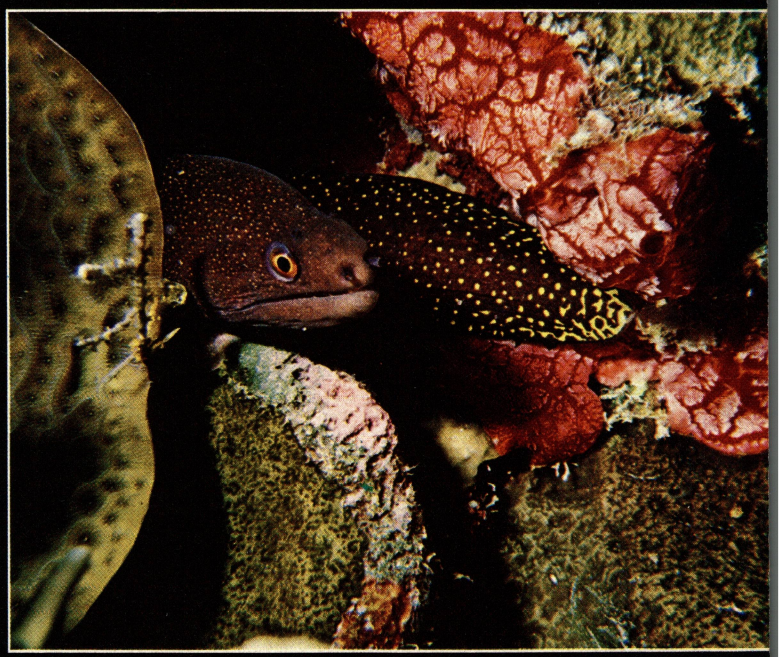
Some close-up lenses, such as those by Hydro Photo, screw directly into the accessory threads at the front of the Nikonos lens assembly. When using these, be careful to flood the space between the close-up lens and the Nikonos lens port to avoid bubbles which would blur your pictures. And, when installing or removing these underwater, hold the control knobs of the Nikonos lens to prevent it from being accidentally twisted off the camera body!

Other close-up lenses, such as those by Novatek™, Oceanic/Farallon, Micro Lens III and Nikon, are a press-fit over the Nikonos lens assembly. This design is especially

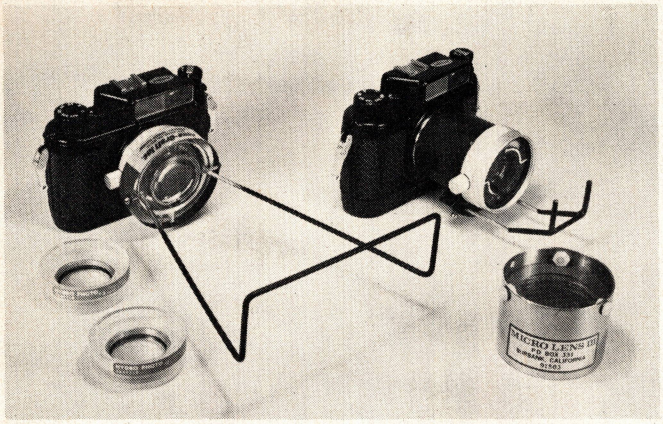


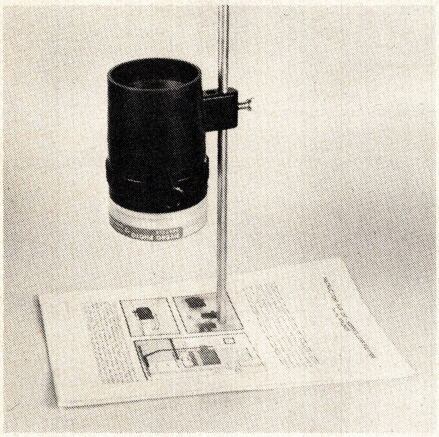
Anemone with orange sponges: Nikonos with 1:1 extension tube.

Hermit crab: Nikonos with 1:1 extension tube.



Goldentail moray: Nikonos with Hydro Photo #2 close-up lens.





Typical close-up attachments (above) for the Nikonos camera: Hydro Photo close-up lenses, Novatek close-up lens with focal frame (on camera), 1:1 extension tube with focal frame (on camera), and Micro Lens III close-up lens.

At left, the Nikonos Lens Focuser (distributed by Aqua-Craft) can be used to check the focused distance with a Nikonos lens used with extension tubes or close-up lenses.

advantageous if the accessory threads of the Nikonos lens mount have been damaged. Most of these lenses will have one or more nylon set screws which press against the side of the Nikonos lens mount to hold the close-up lens in place. The set screw of the Nikon Close-up Kit tightens a metal band running around the inside of the close-up lens mount, and a secondary support rod attaches to the accessory shoe at the top of the camera.

To avoid losing a press-fit close-up lens, tie it to the camera body with a safety cord, and keep your fingers in contract with the lens while swimming to the dive site. Just before shooting, press the close-up lens in place to ensure that it's seated squarely.

Because the optical viewfinder in the camera body and the clip-on sportsfinders are not suitable for close-up work, wands and focal frames are usually used to estimate focused distance and sometimes the picture area. Although these aiming devices may seem awkward at first, you will soon learn how to use them correctly. However, be careful not to bump a wand or framer against the bottom because they can be bent out of alignment.

Expose your close-ups at f22 or f16 whenever possible to maximize depth of field — the zone in front of the lens which will be in acceptably sharp focus. Establish your exposure guides with a test roll of ASA 64 color slide film. Set the aperture for f22 and make exposures with flash-to-subject distances of 9, 12 and 18 inches; repeat these tests with apertures of f16-22 and f16. Select the combination of aperture and distance which gives the best exposure with the smallest aperture, but with an even distribution of light over the picture area. You will find that different settings are best for different subjects. Keep notes of your results.

EXTENSION TUBES — NIKONOS

An extension tube is a metal cylinder, placed between the Nikonos lens and camera body, which decreases the focused distance of the lens to a few inches.

Extension tubes come in sizes, such as 1:1, 1:2 and 1:3. These numbers represent the image ratio the extension tube produces. The first number refers to the size of the subject's image on film, and the second number refers to the subject's actual life size. For example, with a 1:2 tube (pronounced one-to-two), if the image on film is one inch long, the subject's actual life size would be two inches long. In practice, some manufacturers have rounded measurements and the image ratios may not be exact.

Extension tubes are equipped with focal frames for aiming the camera, and most of these are designed for use with the Nikonos 35mm lens. If you have the 28mm lens, be sure that you purchase a tube/framer combination that fits your lens. Actually, the only difference is in the design of the focal frame. The 28mm lens focuses a little closer, has a wider picture angle, and needs a different sized framer.

When using an extension tube, more light will be needed for an exposure than is indicated by the f stop number on the aperture scale of the lens. The longer the tube, the greater the increase required: With a 1:1 tube, exposure must be increased by 2 stops; with a 1:2 tube, 1 1/6 stops; and with a 1:3 tube, 5/6 of a stop. You increase exposure by holding the flash closer to the subject. To establish the correct flash-to-subject distance for your particular extension tube, set the lens for f22, and take test exposures with ASA 64 film and flash-to-subject distances of 4, 6, 8, 10 and 12 inches. Select the distances which give the most pleasing exposures for your subjects.

Depth of field is extremely shallow with extension tubes. With the aperture set for f22, depth of field is about ¾ inch with a 1:3 tube, ⅜ inch with a 1:2 tube and 3/16 inch with a 1:1 tube. Therefore, work with flat subjects and use the framer carefully.

MEASURING THE FOCUSED DISTANCE

If your Nikonos close-ups are consistently out of focus, you may be using the wrong wand or focal frame, setting the focused distance of your lens incorrectly, or your focal frame may be out of adjustment. We've seen new close-up equipment which had been sold with the wrong framer or instruction sheet, and we've seen variance in some Nikonos 35mm lenses.

If you have a focus problem, you can check the focused distance of your lens system with a Nikonos Lens Focuser (distributed by Aqua-Craft). It is a plastic tube which fits over the rear of the Nikonos lens mount, in place of the camera body. Looking into the rear of the tube, you see the subject's image on a frosted, plastic screen. In other words, you are simulating SLR focusing through the Nikonos lens. The directions accompanying the Nikonos Lens Focuser explain how the front of the lens assembly is submerged in a pan of water, and how you measure the focused distance by looking through the lens to see a target at the bottom of the pan.

While the focuser is a valuable tool for checking the focused distance with a close-up lens system, it is most valuable for checking the distance with extension tubes. Because depth of field is so limited with an extension tube, an error of only a fraction of an inch in the adjustment of the focal frame can throw your pictures out of focus.

NIKONOS CLOSE-UPS IN AIR

The directions and focusing aids for Nikonos close-up lenses and extension tubes are usually always for U/W use. Except for the extensive directions for using the Nikon Close-up Kit, focused distances and picture areas for above water close-ups are rarely published.

To measure the focused distance and picture area of a close-up lens or extension tube in air, use the Nikonos Lens Focuser — but without the pan of water. Use some printed or typed material as a target, open the lens to minimize depth of field and to obtain a bright image, and measure the lens-to-subject distance which produces the sharpest image. With an extension tube, the distance in air will be three-fourths the distance indicated by the focal frame for U/W use, but will vary with the design of particular close-up lenses.

When you estimate your exposure settings for close-ups

in air, remember the increased exposure required when using the extension tubes we've mentioned.

HOUSED 35mm CAMERAS

Housed 35mm cameras — with macro, telephoto, normal and wide-angle lenses — are often used for U/W close-up photography.

Macro lenses (sometimes called "close-focusing" or "micro" lenses) can be focused from infinity down to an image ratio of about 1:2, and some can be used with extension tubes to get down to 1:1. Because 50mm and 55mm macro lenses are designed for flatness of field at close-up distances, they produce sharper corners than do normal lenses with close-up lenses added.

Although 50mm and 55mm macro lenses are the most popular choices for general close-up work, they are not always the best choices for image ratios smaller than about 1:3. With the close lens-to-subject distances required, the camera housing and lens port may bump against coral or rock formations, and the bulk of the housing frightens skitterish subjects.

Telephoto lenses — especially close-focusing models, or standard models used with supplementary close-up lenses — can be used for close-up portraits of tiny creatures which you usually can't approach. A 105mm lens, for example, has only about half the picture angle of a 50mm lens, so you can photograph the same picture area at about twice the camera-to-subject distance. However, telephoto close-ups are difficult with moving subjects because of the extremely shallow depth of field available for SLR focusing.

Normal lenses which focus as close as one or two feet can also be used for some close-up shots. A 50mm lens, for example, which focuses as close as two feet will have a picture area of about 9 x 14 inches, for an image ratio of slightly less than 1:10. For smaller picture areas, or for normal lenses which don't focus as close as two feet, supplementary lenses must be used.

Wide-angle lenses frequently can be focused as close as one foot, and can be used for some subjects. The perspective distortion between the near and far subject areas in the picture can create some pleasing effects — the near claws of a crab can loom to be larger than its body in a wide-angle close-up. And near subjects, such as kelp fronds or staghorn corals, can be used to frame a "distant" diver.

SLR FOCUSING

Try presetting for the approximate close-up distance, and fine focus by moving the camera closer to, and further from, the subject as you watch the image sharpen in the viewfinder. In dim light, you can attach a dive light to your housing, strobe, or strobe arm, to illuminate the subject. Or, have a buddy shine a dive light on the subject as you focus.

Focusing on a small, moving fish can be difficult — especially for telephoto close-ups — because the fish often swims in and out of the shallow zone of depth of field. If the fish is moving toward the lens, and you trigger the shutter as the fish's eye comes into sharp focus, you will probably end up with a blurred picture. The fish swam part way through the zone of sharp focus during the delay (which was caused by your reaction time and the play in the shutter control mechanism) which occurred btween the time you started to trigger the shutter and when it was actually triggered. The solution is to *anticipate* the fish's movement, and begin triggering the shutter a fraction of a second *before* the fish's eye comes into sharp focus.

If your camera has interchangeable focusing screens, try using microprism focusing rather than split-image focusing because split-images are harder to see in dim light. We use the Nikon "J" focusing screen.

CLOSE-UP SUBJECTS

A good close-up subject is often relatively flat, fits the picture area of your lens and won't try to escape when you approach. For beginners, try photographing starfish, anemones and sponges which have simple shapes and bright colors. Take time to work with different camera and lighting angles.

The main point of interest should be sharply focused. If the eye of a fish or small eel is sharply focused, it often doesn't matter if the tail or body is within the zone of depth of field. But if you photograph fish when they are slightly sideways to the camera, more of the body will be sharply focused.

When searching for close-up subjects, get close to the bottom and move slowly. If you are doing 1:1 extension tube work, examine the plants, bottom and coral or rock formations inch by inch. Look under ledges for small, hidden subjects.

CONTROLLING THE BACKGROUND

Many tiny animals are difficult to photograph because they hide by blending into the background. Background problems can often be solved by moving the subject. A hermit crab, for example, can be moved to a coral head or other attractive background such as the lavender base of a seafan. Wait a few minutes, then take its portrait when it peeks out of its shell. Nudibranchs, starfish, and arrowcrabs can often be moved or maneuvered to an uncluttered or more colorful background. Try placing arrowcrabs on seafans or yellow sponges. However: If you do move a creature, handle it gently! And after you take your pictures, return your subject to where you found it.

An upward camera angle can sometimes be used to obtain a blue-water background. Look for subjects which you can shoot from below — such as a flamingo tongue high on a gorgonian, the arm of a feather starfish projecting out of a crevice at the top of a ledge, or possibly a subject such as a hermit crab which can be held by hand. For dark backgrounds, level camera angles can be used against a darker, mid-water background.

BODY CONTROL

Body and buoyancy control is essential. Once you have spotted a potential subject, follow these three steps:

1. Look for a place to stand, kneel or otherwise support yourself. Get your body — especially your fins — under control. You should be able to settle gently on the bottom, or hold yourself on a vertical wall with one hand, before you take a picture. Avoid wearing too much weight — you'll crush delicate marine life if you slam against the bottom, and your fins can destroy more life if you must kick yourself off the bottom. Neutral buoyancy, or a couple of extra pounds at the most, is usually your best weight.

2. After your body is in position and your fins are still, adjust your strobe arm, or detach your hand-held strobe, and position it for a picture.

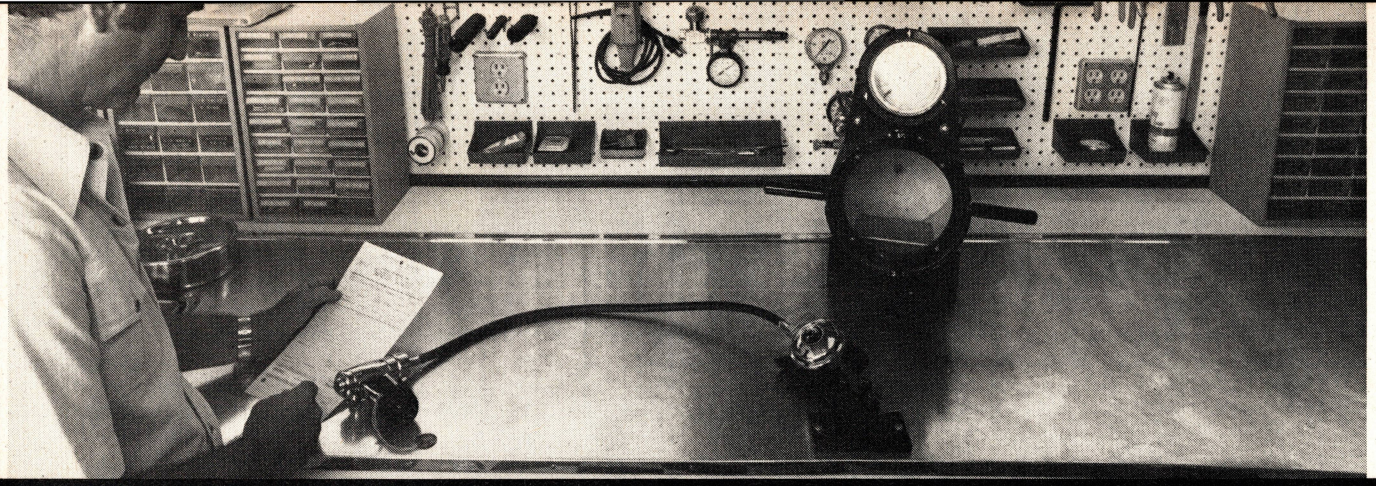
3. Use your wand, focal frame or SLR viewing system to focus and compose your picture. Check the position of your strobe once more, and then take the picture.

The most common mistake beginners make is to reverse these steps: They begin by ramming their focal frame against the subject (or their eye to the SLR viewfinder) before attempting to detach their strobe arm. Then, they take the picture while kicking their fins to hold their bodies in position.

CLOSE-UP DEPTH OF FIELD

REPRO RATIO	PICTURE AREA (inches)	APERTURE f/11	f/16	f/22
1:10	9.4 x 14.2	2.42	3.52	4.84
1:8	7.6 x 11.3	1.58	2.30	3.16
1:6	5.7 x 8.5	.92	1.34	1.84
1:4	3.8 x 5.7	.44	.64	.88
1:3	2.8 x 4.3	—	.51	.70
1:2	1:9 x 2.8	—	.28	.40
1:1	.9 x 1.4	—	.13	.18

Total depth of field in inches. Depth of field for image ratios of 1:10 to 1:4 are for supplementary close-up lenses. With macro lenses, consult owner's manual for exposure compensation and depth of field tables. Depth of field for 1:3 and small images are for Nikonos extension tubes and has been adjusted for bellows factor. (Standard: circle of confusion, 0.001 inch.)



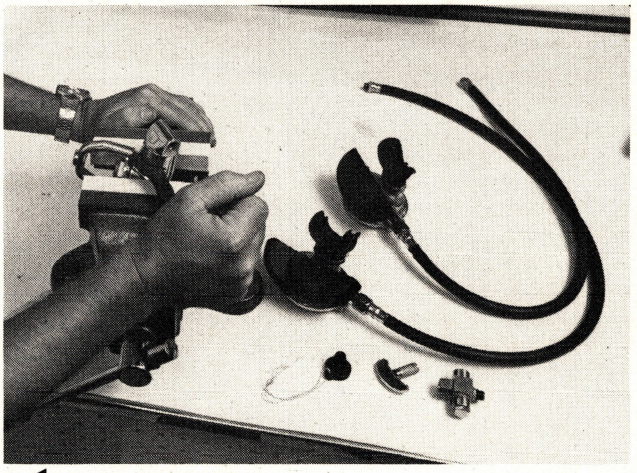
REGULATOR REPAIR

"I've seen it all," sighed George Garrison, owner of National Scuba Repair, as he pulled a large box of parts from underneath the desk in his office. Spreading out a random assortment of regulator pieces with ailments ranging from corrosion to rubber cancer, he pondered the maintenance problem faced by every qualified repair technician in the country.

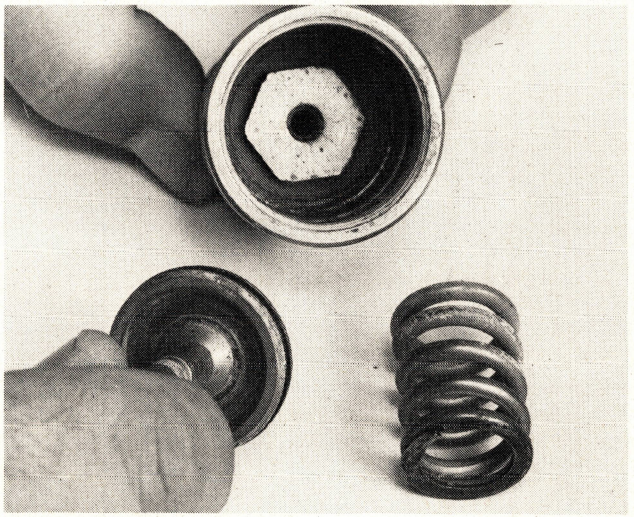
"For a piece of equipment that is the diver's only link to life, you would think a regulator would have a little higher priority on everyone's maintenance list. Yet we see problems that are really very serious because virtually no one performs regular preventive maintenance on their breathing equipment." It is a scandal that poor performance of regulators due to the lack of, in most cases, any maintenance is a way of life for most divers in the United States. The gravity of the problem should not be shrugged off lightly. Dr. Glen Egstrom, of the UCLA Diving Safety Research Project, examines the equipment of most fatalities in Southern California waters and has found that in virtually every case, the regulator was not breathing at its potential capability due to inadequate maintenance.

Dave Inman, of Divers Unlimited in Hollywood, Florida, sees an awful lot of regulators each year in his mail order repair business. He likes to compare most people's attitudes about regulator tune-ups to a trip to the dentist — something you need to do, but put off as long as you can. Yet, a regulator tune-up is a real bargain compared to the expense skiers and tennis players must bear keeping their equipment in good shape. The $25 or so it costs to have your regulator completely overhauled may seem like a large expense compared to its relatively modest purchase price, but we should have our regulators checked and serviced before each season, the way skiers have their equipment serviced. Divers who don't do this probably have a fundamental misunderstanding about what happens to a regulator after it disappears into the back room of a dive store or is sent to one of the large mail order equipment repair facilities.

A common misconception is that regulators are simple instruments. They most certainly are not. They are dynamic devices that must regulate and balance tremendous pressures and still deliver gentle breaths of air, regardless of depth. The most frequently used regulator today is the flow-through piston first stage with a downstream second stage. Although the total number of parts varies according to the features of each brand, one thing is common — an imbalance



1 **The technician will replace all parts subject to deterioration even though visual signs of wear may not be apparent.**



2 **Dried salt crystals can start corrosion and will measurably affect regulator performance. These internal parts must be cleaned to prolong their life.**

Regulator repair requires a highly skilled technician and the proper tools. Major regulator servicing should take place at least once a year with tune-ups every 12 dives.

AN INSIDE JOB

By John Columbia

anywhere, no matter how slight, can result in a dramatic increase in breathing effort. Dr. Egstrom recently pointed out that the average corrosion build-up in his regulators used by UCLA students can add an inch to two inches of inhalation effort when measured on a manometer. For most regulators, that is an increase of 33 to 66 percent. And that is just the oxidation problem caused by the demand lever and the diaphragm button.

When you drop your regulator off for service, most maintenance technicians follow a standard procedure in diagnosis and repair. Beginning with the problem stated on the repair ticket, they connect it to a source of high pressure air and measure and note the flow rate and suction effect. The entire regulator may then be submerged in water and examined for bubbles coming from either the first or second stages. Above water, the high and low pressure hoses are examined for signs of wear and the pressure gauge is checked against the master bench gauge for accuracy. That check completed and noted on the repair record, the regulator technician disassembles your regulator with the following goals in mind:

1) Identify and replace any defective parts.
2) Replace all parts subject to deterioration from age, regardless of whether or not visual signs of wear are readily apparent.
3) Clean all parts not replaced.
4) Lubricate all moving parts and polish all metal sealing surfaces.

Disassembling your regulator for cleaning and repairing can be a real exercise if it is badly corroded. A liberal amount of lubricating penetrant (*the only time this may be used*) and a good command of Anglo-Saxon curses come in handy here. Rarely, your first stage may be so corroded it is impossible to disassemble. In this case, the repair bill will be very high, perhaps as much as one-half the cost of the regulator. You will probably get a call if a situation like this has developed.

Cleaning is the most important function in prolonging regulator life — both during use and in servicing. As few as ten drops or less of salt water on the sintered brass screen of the first

PHOTOGRAPHY BY GERI MURPHY

3 **Metal parts are submerged in a light acid bath and placed in an ultra-sonic cleaner to remove accumulated corrosion.**

4 **After about 10 or 15 minutes, the corrosion has been vibrated away and the acid bath is drained from the tray.**

5 **Once the cleaning process is complete, the parts are placed in a detergent solution to neutralize any acid traces.**

stage of some regulators can measurably affect performance. Dried salt crystals can scrape through chrome plating and start corrosion, put nicks in a vital O-ring, or ruin a high pressure seat and cause free flowing. The internal parts of a regulator are machined to almost watch-like tolerances and deserve the same delicate treatment.

After stripping your regulator down, your repair shop will automatically remove and discard all O-rings. These need to be replaced as preventive maintenance. The metal parts are then submerged in a stainless steel tray inside an ultra-sonic cleaner filled with five percent acetic acid and a non-sudsing detergent such as Formula 409. The bath may or may not be heated to increase its efficiency during the 10 to 15 minutes it will take to vibrate away all accumulated corrosion.

The next step is to remove the parts from the bath and blow them dry with compressed air. After drying, the technician will use a magnifying glass and light to inspect the first stage for pitting or deep scratches caused by salt crystals in the piston bonnet. Pits and scrapes prevent the O-ring of the piston from forming a perfect seal and result in a free flow situation at the second stage. A badly scored bonnet costs up to $100 to replace. This is why most repair stations insist on a total overhaul each time you bring your regulator in — a problem in the second stage could be caused by wear in the first stage.

All sealing surfaces of the first stage are inspected for chrome flaking and pitting — threads are examined for unusual wear or evidence of past cross threading. Springs are checked for fatigue or rust and replaced if not perfect.

The piston needs very special inspection. The lip of the stem in most flow-through regulators is machined to very fine tolerances and the slightest nick or dent will cause a free flow malfunction. Pistons cannot be repaired and must be replaced if damaged in any way.

The yoke and yoke screw are also checked at this time. Explosive yoke failures are rare, but they have happened — especially in older regulators and more commonly at dive store filling stations. Older yokes were designed before 3000 psi tanks — yours may need to be upgraded. Hairline cracks can often be seen with a magnifying glass and worn threads may call for a new yoke screw.

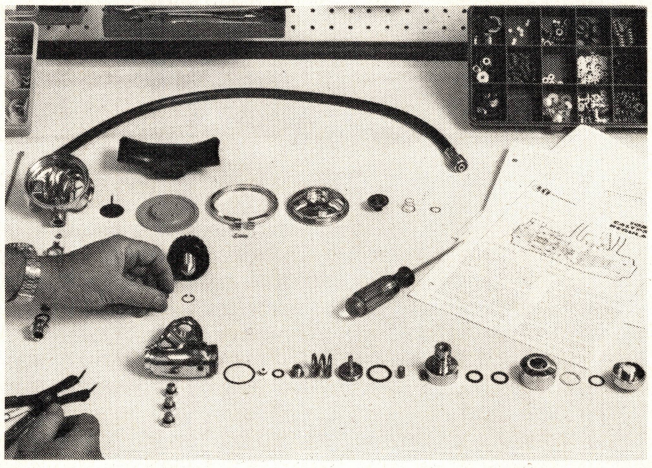
During this entire procedure, the repair technician will note on the repair bill any deficiencies and put all worn replaced parts in a bag for your inspection.

After the first stage has been torn down and inspected, it is time to dismantle the second stage. A good inspection here includes a sharp visual examination for cracks in the housing and breaks between soldered joints. One area especially vulnerable is where the demand valve and lever attach to the second stage body. In plastic second stages this is often overtightened and frequently splits. Any sign of cracks in either brass or plastic second stages demands a complete replacement and a higher repair bill. Never attempt to tighten your second stage hose or demand lever assembly without proper tools and training.

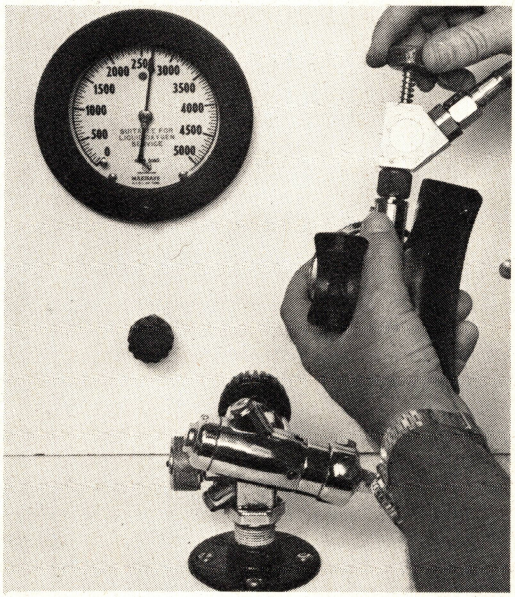
The surfaces where the diaphragm and exhaust valve seal also get particular inspection. Spot failure of either could cause a catastrophic flooding. The ring that holds the cover and the diaphragm in place needs to be checked for any bends — a less than perfect seal will result in a steady and annoying drip of water during inhalation and a considerable increase in breathing effort.

The diaphragm of your regulator is a beast unto itself. In older models it is usually made of laminated neoprene. The inherent stiffness of this material in older single hose regulators contributed greatly to breathing resistance. Most companies now offer replacement diaphragms in tough, lightweight silicone rubber. Even if yours doesn't need replacing, you should consider upgrading to these newer parts. The metal button on your diaphragm can also cause resistance if it is rusted or if

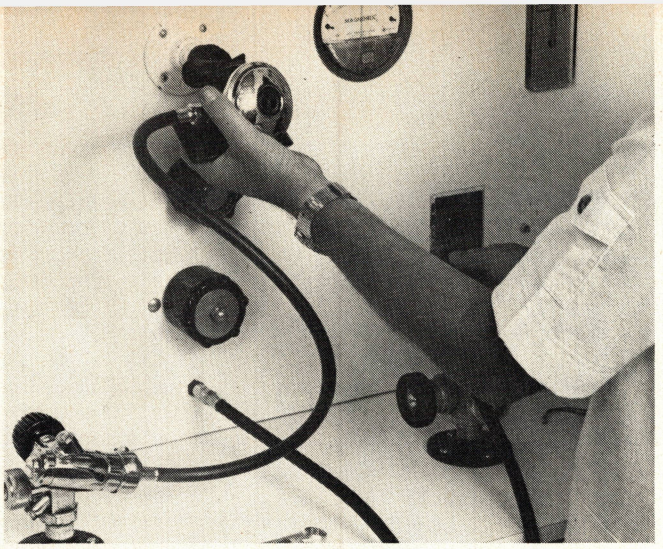
The final bath consists of clean, fresh water to rinse away all traces of the two previous solutions. **6**



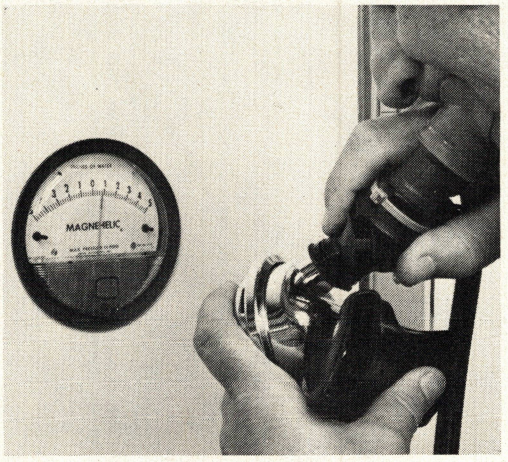
After drying, all parts are inspected for pitting, scratches and wear. Any replacements are made at this time. **7**



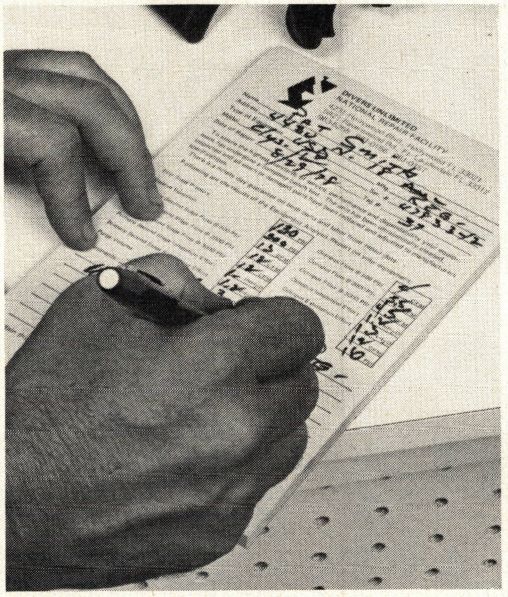
With tank pressure on, the height of the second stage demand lever is adjusted to manufacturer's specifications. **8**



9 **Still on the test bench, the regulator second stage is next tested for the effort required to inhale and exhale.**



10 **More than one inch water pressure in exhalation effort and more than 1½ inches in inhalation is unacceptable.**



11 **The Equipment Analysis Report shows the regulator's performance after it has been cleaned and overhauled.**

salt deposits have built up — it will be buffed smooth if necessary. This button is the first mechanical step in the breathing cycle — it must be inspected for distortion and glue fatigue.

The parts of the demand apparatus and lever are now inspected for corrosion and wear. The lever may be buffed for smoothness and the demand seat is examined for scoring. The downstream valve should also be replaced.

The first stage is tested after reassembly by subjecting it to tank pressure with the high pressure port blocked and an ambient pressure gauge — bleeder valve open — attached to a low pressure port. The gauge must be watched carefully as the bleeder valve is closed. If pressure climbs up to 200 psi, air is immediately shut off. The excessive pressure indicates either a defective high pressure seat seal or a defective high pressure spring. If the psi remains under 200, then the precise gauge reading is checked against manufacturer's intermediate pressure specifications.

This step affords the first opportunity to check for leaks, but placing the ear next to the first stage must be avoided. Should a new seat or seal blow, injury to the eardrum could easily result. Safe alternatives are a modified stethoscope, or a liquid leak detector. The over-ambient pressure gauge is observed for the desired reading, and again one minute later for "creep." The latter may indicate a leak in the high pressure seat — possibly a nick in the piston seating surface.

Volume also must be measured for conformity with manufacturer's specifications. A professional repairman should be aware that some regulators can be incorrectly adjusted to produce easy breathing at low psi and volume. Such adjustments are unacceptable. Manufacturer specified volume and pressure must be achieved.

When the second stage is reassembled, the plastic second stage is checked for cracks and the housing for faults, especially in the exhaust valve and diaphragm seals. The new exhaust valve is installed without silicone because it requires maximum friction to hold it in place. The silicone could pick up sand and spoil the seal. Excess rubber on the mushroom stem must be removed. Following replacement of the exhaust tee, the mouthpiece bits need checking for possible damage indicating need for replacement.

The low pressure seat requires a careful inspection with a magnifying lens for dents or scratches, and to be sure the low pressure valve has formed only one circular indentation. If more than one circle has been formed, the valve will not seal, and the seat must be replaced.

As much as possible, the mechanism of the second stage should be reassembled outside the casing, then reinserted with the venturi aimed directly at the mouthpiece. The circlip is attached next and properly seated.

The low pressure hose is then examined for defects and tested for leaks at twice its working pressure. It is attached to the first stage and any moisture is blown out of the line before it is attached to the second stage.

With tank pressure on, the demand lever height is adjusted to manufacturer's specifications.

Reinstallation of the second stage diaphragm demands particular care because of the danger to the diver if it malfunctions. It is first wiped with silicone only on the metal plate, *not around the edges.* Lubricant around the edges invites immediate or eventual failure of the seating.

The purge mechanism, having been replaced, should be adjusted to a low volume purge flow. A large volume purge flow is unnecessary and distracting to the diver.

Before replacing the clamp, the box around the cover is pressed to trigger any free flows stemming from improper lever height. After the clamp is screwed in place, the purge valve is double checked.

With the air turned on, the second stage is checked for audible leaks, then ease of breathing. With the air off and any re-

(Continued on Page 82)

LITTLE LOOE KEY

A marine sanctuary battleground . . . with something special for everyone.

By Bill Barada

Looe Key is a tiny coral reef that lies about ten miles offshore from Big Pine Island in the Florida Middle Keys. Its total area, including patch reefs and straggler clumps, covers less than seven square miles and the major reef line is only about a mile long and one-fourth to one-half mile wide. This small area, however, contains some of the most magnificent and impressive coral structures found anywhere in the Florida Keys and many divers claim their beauty rivals that of any coral reefs found in the Caribbean.

An indication of little Looe's attractiveness is that veteran dive guides from Key Largo all the way to Key West almost unanimously acclaim this coral reef as "something special." Marine scientists describe Looe's coral structures and formations as "unique," and most divers visiting Looe for the first time react with superlatives such as "gorgeous" or "spectacular."

One of the things that makes Looe's reefs "special" to keys divers is the size of its corals. The structures of tongue and groove formations on the seaward edge of the reef rise as high as 25 feet above the bottom, the highest in the keys. Amidst the bewildering diversity of corals that form the colorful archways, terraces and colonades of these structures are more than 100 monstrous specimens of mound corals, such as brain and star, that form balls and domes more than 20 feet in diameter. In another section huge stands of pillar corals with spectacular, cathedral-like spires, tower as high as 20 feet above the bottom.

Shoreward from the seaward edge are splendid forests of elkhorn that are so extensive a diver can weave for hours among the branching, jagged antlers and never see the same colony twice. In the "backside" shallows you can stand on a white sand bottom in three or four feet of water and be surrounded by delicate staghorn corals with the pointed antlers of other colonies rippling the surface all around you.

A short swim beyond the seaward edge of the reef, at a depth of about 50 feet, is the edge of a channel carved by the Gulf Stream. The bottom slopes sharply downward to the top of a cliff that drops vertically to a depth of around 100 feet. This area may have once been the shoreline of an ancient sea. The wall is an intricate maze of older, deep-water corals and giant, colorful sponges that decorate the mouths of deep caves and crevices which are hiding places for a wild assortment of marine life. It is in this area that divers are apt to experience close encounters with large bottom fish and the open water game fish that migrate along the edge of the Gulf Stream.

What makes Looe Key uniquely beautiful, however, is that this wide diversity of coral phenomena is compacted and compressed into a single, small area and it can all be seen and enjoyed on the same dive. Add to this the constantly moving panorama of schools of brilliantly colored tropical fish that weave in and out among the corals; the graceful crimson and gold of seafans and searods that sway and twist in the surge; the whip-like antennae of lobster colonies bristling from holes and crevices; and the gaudy colored bodies of tube worms, sea snails and shellfish that creep among the branches. Then, place it in an area that is caressed by Gulf Stream currents and blessed with some of the clearest water in the keys and it is easy to see why Looe Key is considered "special" to divers who know what it has to offer.

Despite its attractiveness, Looe Key was unknown to most tourist divers until a few years ago. The reason for this is that the islands opposite the reef, such as Big Pine Key, were relatively undevel-

photography by Paul Tzimoulis

oped and the few services available to tourist divers were not well advertised. As a result, most divers visiting the Middle Keys stopped in the City of Marathon rather than continue on across the Seven Mile Bridge into the unfamiliar territory of Big Pine Key which is only about 20 miles farther. Looe reef is also a 20 mile boat ride from Marathon and these dive shops preferred to concentrate on trips to close-in local reefs such as Sombrero and Coffin's Patch rather than make the long run to Looe reef. Today, however, Looe Key is in the process of being discovered. Two full service dive shops are located on, or near, Big Pine Key and are running daily guided tours to the reef which is only a few minutes by boat. Hotels, motels, trailer parks and restaurants in this area are catering to divers, and a few Marathon dive shops will charter all-day trips to Looe. The dive services provided by the two shops in the Big Pine Key area are almost as unique as the corals of Looe Key.

The Sunshine Key Aqua Center is located at the Holiday Inn Travel Park on tiny Sunshine Key which is a few minutes drive beyond the Seven Mile Bridge. It is owned and managed by Captain Ed Davidson and Sandi Disceglia. Both are dedicated conservationists who have made extensive studies of marine ecosystems in the keys and this knowledge has made them valuable leaders in keys environmental and political organizations. Ed Davidson is president of the Keys Audubon Society, director of the Keys Citizens Coalition, chairman of the Keys Zoning Board and vice president of the Florida Coral Reef Foundation. As a result, he is constantly involved in controversial keys environmental fights and is often responsible for initiating and leading such battles. For example, he was a leader in the fight to ban coral collecting in Florida and helped initiate a proposal to have Looe Key declared a federal marine sanctuary by the National Oceanic and Atmospheric Administration (NOAA). The proposal is under study and, at present, is one of the hottest issues in the keys.

Ed and Sandi's conservation background and their knowledge of marine ecology are reflected in the type of dive tours provided by the Sunshine Key Aqua Center. They not only offer sightseeing, underwater photography and diver instruction, they also run educational field trips for marine science students and other divers who are interested in learning more about the underwater world. Most divers love it. Instead of just looking at the pretty fish and corals, they are told something about the habits of the reef dwellers and their interrelationship with the corals, water and land area of the keys.

Ed and Sandi treat Looe Key as if it is already a marine sanctuary and insist that divers aboard their boat give it the same respect. Ed is not opposed to spearfishing, lobster hunting, shell collecting and similar activities, but is convinced they should be pursued in places other than Looe Key. No spearfishing or specimen collecting is permitted from his 64 foot, twin diesel dive boat when it is anchored at Looe. Many of his customers are families with children who are afraid that spearing fish will attract sharks.

The Aqua Center also has a six-passenger boat plus other boats that Ed is happy to rent to qualified divers who want to go after fish, lobsters or sea shells. He will tell you where and how to

find the places most apt to produce good results. His large boat has an 800 mile cruising range and is equipped with bunks, galley, showers, compressor and generator for chartering to such places as Cay Sal Banks and the Dry Tortugas.

The other shop running daily trips to Looe Key is Underseas, Inc. located on Big Pine. It is owned and managed by Captain George W. Rockett whose policy and opinions are diametrically opposed to those of Ed Davidson. The Undersea Center runs three, eight-passenger dive boats to Looe on either half day or full day trips and they specialize in spearfishing, lobster diving, shell collecting and similar activities. Rockett's trips are unique in the keys because he has cooking facilities aboard each boat and a hot lunch is available to all-day customers with a standing offer that the fish and lobsters they catch during the trip will be cooked on board the boat, free of charge.

Rockett is adamantly opposed to the idea of Looe Key as a marine sanctuary because he is convinced the national publicity generated by the federal government will cause the reef to be discovered and an avalanche of divers will descend on the tiny coral reef with disastrous results. His desire to protect the reef by keeping it quiet is supported by the fact that although his shop has been located on Big Pine Key for several years, it is not widely known outside of Florida because he does not advertise in national publications and does not encourage referrals of customers from other dive shops. Rockett claims he has the largest retail dive shop in the keys and this is made possible by the type of charter service he runs because the profits from gear sales are needed to support the charter service.

Rockett says there are tremendous schools of fish in the Looe Key area but you must know where they hang out in order to find them because the spear-sized fish are not in the major coral sections. He claims that spearfishing does not damage the reef or reduce fish populations because the species he hunts are migratory. He feels the same way about lobsters and sea shells because most lobsters are found in blowouts (depressions similar to sinkholes in shallow water areas) and the majority of sea shells are hunted on grass flats.

Rockett admits that Looe Key is becoming more and more popular but claims that the dive guides now operating in the area know what they are doing and help protect the reef corals. The proposal to declare the reef a federal marine sanctuary terrifies him, partially because singling out Looe will concentrate diver pressure on the tiny reef, and also because of the stated policy of NOAA. This is that "multiple use of each area should be maximized . . ." In the past this has meant that sanctuaries will not interfere with commercial fishing. Rockett is convinced that only sport diving will be regulated and restricted while commercial fishing, including nets and lobster trapping, will still be permitted as they now are in Pennekamp Park and the federal government's Key Largo Coral Reef Marine Sanctuary.

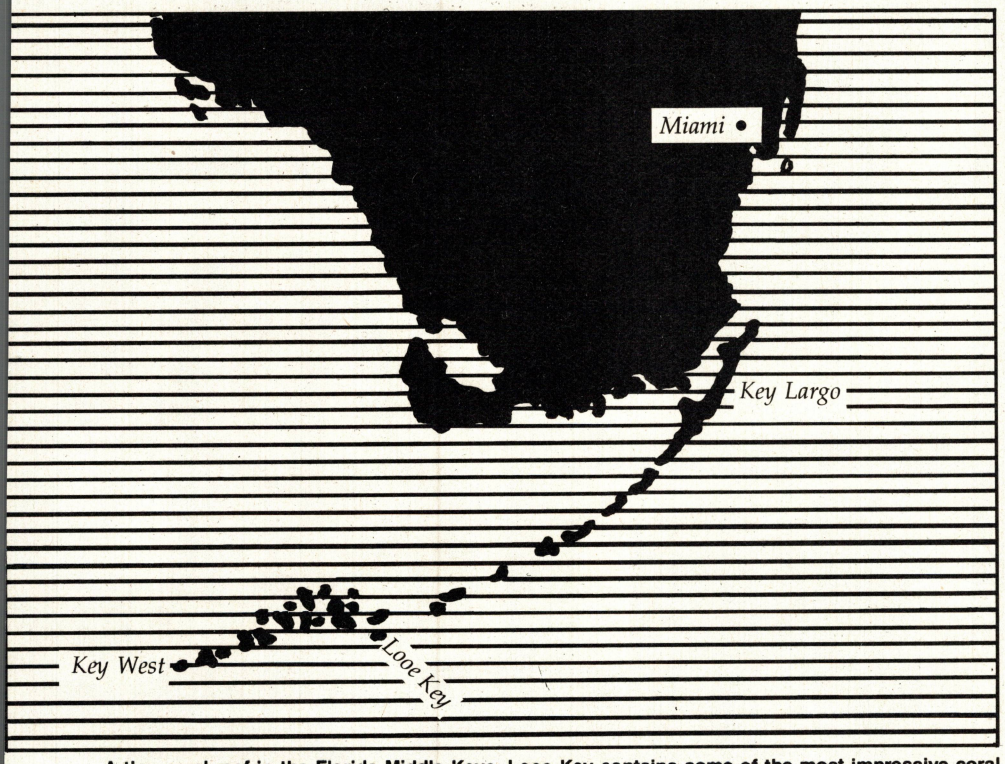
Ed Davidson contends that diver pressure is already building up on Looe Key with as many as 30 dive boats anchored on the reef on some weekends. He says at present the only federal regulation is the ban on coral collecting and that novice divers who don't know any better are shooting colorful reef fish such as angels, tang and grunts. Ed believes that establishing Looe as a sanctuary will benefit fish and lobster populations in surrounding areas by serving as a haven in which populations can multiply unmolested, then migrate to outside areas.

Keys dive guides are about equally divided on the sanctuary proposal but, regardless of its outcome, Looe Key's spectacular coral reefs will continue to be regarded as special. The reasons for this are the unique conditions that created the magnificent corals and bathed them in some of the most consistently clear water of any keys reefs.

Not only is Looe Key farther offshore and closer to the warm, clear waters of the Gulf Stream than most other Florida coral reefs, it is also protected by Big Pine Key which is the highest and one of the largest islands in the keys. For this reason the tidal waters flowing out from the shallow back country on the gulf side of the keys (which is subject to sudden, drastic temperature changes and is often turbid), is diverted into tidal channels such as Bahia Honda and American Shoals, away from the reef. Thus, Looe's corals are protected by a natural eddy that provides clearer, calmer water than on most other Florida reefs. The average visibility is around 50 feet, but when the Gulf Stream is pushed inshore by prevailing winds, the water clears as if by magic and visibility often exceeds 100 feet. When strong northeasterly winds persist for several days, however, sediments in shallow water are stirred up and visibility can drop to less than ten feet. This happens most often during the winter and spring, so the best time to plan a trip is during the summer and fall. But even in winter the Gulf Stream often sweeps over the reef, the water clears as if by magic, and you are apt to encounter strange marine life seldom seen in summer because fish move south when northern waters get cold, then migrate back up the coast as the water to the north warms up again.

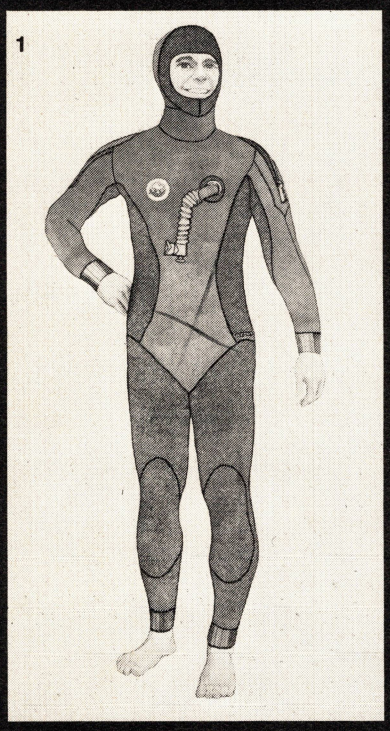
The story of how tiny Looe Key got its name is almost as fascinating as its coral formations. According to research done by Capt. Ed Davidson, it has been called Looe Key as long as anyone can remember, but nobody knew why. The mystery was solved in the 1950's after Edwin Link and Mendel Peterson (who was with the Smithsonian Institute) found the remains of an old ship buried under the corals of the reef. Research identified the wreckage as that of the *H.M.S. Looe*, a 44 gun British frigate that crashed into the reef during a storm in 1744 while towing another ship captured from the Spanish. The British Admiralty records and

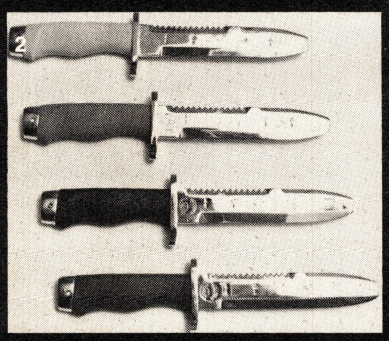
(Continued on Page 66)



A tiny coral reef in the Florida Middle Keys, Looe Key contains some of the most impressive coral structures found anywhere. It's farther offshore and closer to the warm, clear Gulf Stream waters than most other Florida coral reefs. Average visibility here is around 50 feet but it often exceeds 100.

New Gear





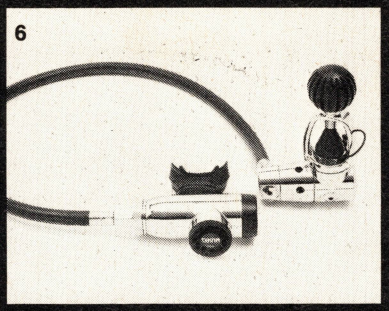
1 Jetsuit — A new drysuit featuring manual or automatic air injection, easy-entry shoulder zipper, wrist and ankle seals and a patented neck seal with an attached hood. It comes in blue or orange with black trim, nylon-two. Sizes XS to XXL. $450. From Poseidon Systems. At your Parkway/Poseidon dealer.

2 Seamaster Knives — A popular line of dive knives, redesigned for 1979. They feature a blunt, screwdriver-type end, serrated top edge, six-inch scale, and 300 series stainless steel. Handles are yellow, orange, brown or black. Sheath is included. $23.95. From U.S. Divers. Available at your U.S. Divers dealer.

3 Aqua-Lung BC — A new series of BC's for 1979, featuring heavy cordura nylon material, inner bladder, low pressure inflator, oral inflator, trim and over-pressure valve, CO_2 cartridge and comfortable harness. Comes in yellow, light blue, or black, $134.95. From U.S. Divers. At your local dive shop.

4 Competition Fin — Combines the power of the open heel design with the security and comfort of a full foot fin. Model TX-1000 has been designed for speed in swimming and for power with a full, cold water wetsuit. Available in sizes 9/10, 11/12 and 13/15. $32 to $34. From Dacor. At your Dacor dealer.

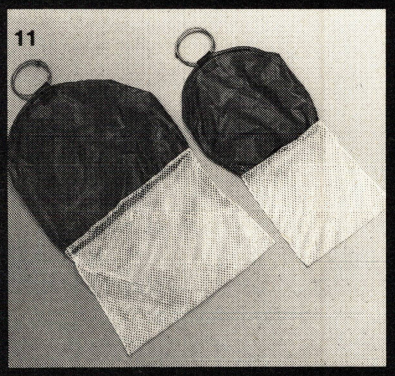
5 Dive Suit Bag — A deluxe, vinyl-coated bag with two compartments: one for your wetsuit, BC, fins, mask and snorkel, plus a large side pocket for regulators, gauges and accessories. It features doublelock zips, heavy-duty handle, and shoulder straps for long hauls. $76. From Scubapro. At your Scubapro dealer.



6 T-2100 Regulator — A unique new design in high performance regulators. The T-2100 incorporates a balanced piston first stage with a highly efficient "servo-assisted" second stage. A small pilot valve "assists" the main valve to provide effortless breathing at any depth. $189.95. At your Tekna dealer.

7 Pelican Bag — A fashionable utility bag with eight separate compartments for easy organizing, a hidden key ring clip, and a comfortable, adjustable strap. Made of rugged cordura nylon, it's waterproof, mildewproof, and machine washable. $34.95. From Pelican Products. At the sign of the happy Pelican.

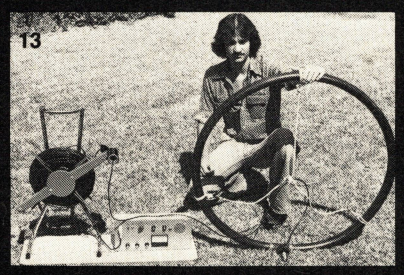
8 M-90 Buoyancy Compensator — Designed to withstand the rugged treatment of a working diver. The outer bag is made of extra-heavy gauge nylon with a special urethane backing. It's compact, yet provides 33 pounds of lift. The 25 gram CO_2 cartridge is optional. $100. From SeaQuest. At your local dive shop.

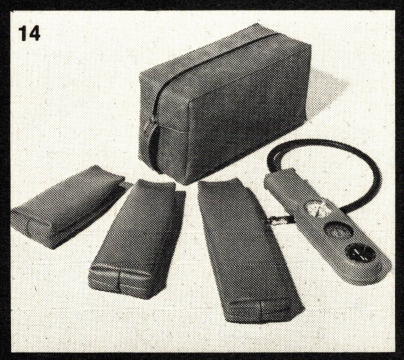


9 Electronic Dive Watch — Pressure-tested to 100 atmospheres (3300 feet), it features a quartz movement and is accurate to within 60 seconds per month. It has an electronic jeweled movement, sapphire crystal, ratchet bezel, calendar, and stainless steel case. $300. From Dacor. At your local Dacor dealer.

10 Softouch Prescription Goggles — New anti-chlorine, corrective goggles provide perfect sealing, minimum drag, and clear vision for eyeglass wearers. They are soft, flexible, and safe. Send eyeglass prescription and distance between pupils. $39.95. From Aqua Optics, 575 W. Sixth St., San Pedro, Calif. 90731.

11 Game Bags with Lift — Designed with built-in lift pockets which can be filled with tank air to raise game to the surface and hold it floating for the return trip. They come in blue reinforced nylon with mesh bottoms and large belt loop rings. Small, $18; large, $30. From Scubapro. At your Scubapro dealer.

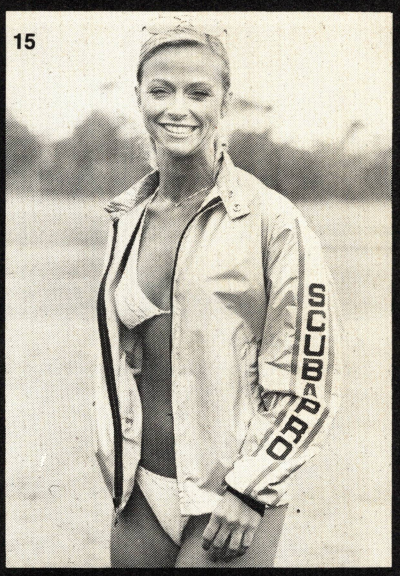




12 CV60 BC — Provides 25 pounds of initial buoyancy with 12 additional pounds reserve buoyancy available by opening the zipper on the bottom. It features an automatic relief valve, lip-stop coldwater mouthpiece, zippered pocket and 25 gram CO_2 cartridge. $135. From Dacor. Available at your nearby Dacor dealer.

13 Boat Operated U/W Metal Detector — Can detect metal objects from a boat in water up to 250 feet deep while distinguishing between trash and treasure. Meter and loudspeaker provide detection data. It's powered by two D-size batteries. $985. From Gardiner Electronics, 4729 North 7th Avenue, Phoenix, AZ 85013.

14 Console and Regulator Bags — Protect your valuable instruments against bumps, scuffs and scratches. Console bags are available in three different sizes and five colors. They are also oil and mildew resistant. Prices start at $4. From Pennform Plastics Products, 365 Mulberry St., Wyandotte, Michigan 48192.



15 Silver Jacket — A flashy new nylon windbreaker with a reflective silver coating and "Scubapro" sleeve striping. It's water-repellent and features slash pockets, nylon zipper, racing collar, and knit cuffs. Sizes, available for both men and women, range from XS to XL. $36. At your nearby Scubapro dealer.

16 Brute Boot — A virtually indestructable, yet highly protective and comfortable boot. The non-skid sole is bonded onto the bottom of the boot, making it of solid, one-piece construction. Available in blue nylon-two with black dipping; sizes 7/8 to 12/13½. $39. From Parkway Fabricators. At your Parkway dealer.

17 Aqua-Lung T-Shirts—Three unique new designs illustrate marine awareness, sport diving, and commercial diving. The T-shirts are high quality 100 percent cotton with crew neck and pocket, and come in blue or yellow, sizes S, M, L, and XL. $4.95. From U.S. Divers. Available at your nearby U.S. Divers dealer.

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LOOE KEY

(Continued from Page 63)

other reports pieced together by Mendel Peterson reveal a fascinating story.

When daylight came on the morning after the wreck, 280 men from both ships found themselves crowded together on a tiny sand island in back of the reef and still about seven miles offshore. Their situation appeared hopeless because at that time the keys were inhabited by Caloosa Indians who were reported to be cannibals who considered white men an especially tasty dish. Thus, going ashore would be almost certain suicide and their only hope was to get off the sand island before they were discovered by the Indians. Only three small boats survived the shipwreck, however, so escape by sea appeared equally hopeless. Their only consolation was that food, water, hand weapons and other provisions could be salvaged from the ships stranded on the reef.

Fortunately, a small sloop was sighted sailing near the reef and the crew rowed out in a small boat, captured it intact, and brought it back to the reef. Then, all 280 men were jammed together in the small boats, the wrecked ships were set on fire, and the flotilla set sail. The captured sloop held 184 men, 60 were packed into the ship's long boat, 20 in the captain's gig, and 10 in a rowboat.

Incredibly, although the boats were so overloaded that a moderate breeze or any carelessness would cause them to capsize, all 280 men survived. The small boats made their way across the Gulf Stream to the Bahamas and the captain sailed the tiny sloop all the way to Port Royal in only five days.

That is how Looe Key got its name. The wreckage of the *H.M.S. Looe* is still buried under the sand of the reef and Ed Davidson says if you know where and how to look for them, the ballast stones and scattered remnants of the ship's structure can still be seen.

A more recent but equally fascinating story of a ship that crashed into Looe has been dubbed the Reefer Wreck because it was loaded with 50 pound bales of marijuana. The grass from broken bales was scattered all over the reef and after the Coast Guard removed the bales, keys residents had a field day. A small armada of boats converged upon Looe to scoop up the grass still floating on the surface and stacked two feet deep on the bottom of surge channels.

Ed Davidson says the water was stained dark and the reef fish were acting so crazy he is convinced they were high on grass. He saw small fish eating marijuana seeds, and hundreds of fish swam in wild gyrations, bumping into each other, crashing into the corals, flipping upside down and sideways or standing on their heads. Ed swears that some of

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the fish looked as if they were laughing, but this opinion may be biased because he could taste marijuana that seeped into his mouthpiece.

The marijuana is all gone now and the fish are back to normal, but the wreckage of the Reefer can still be seen scattered among the corals of Looe Key.

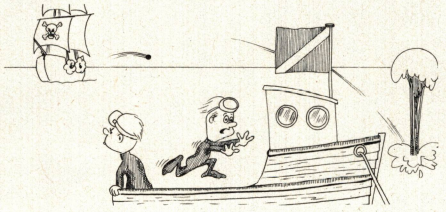
As we said earlier, one of the great attractions of Looe Key is that its corals are so compart and compressed into such a small area they can all be seen on a single dive. An advantage of this is that large groups with a wide diversity of dive experience can enjoy working from the same boat without interfering with each other. Ed Davidson takes entire families, including dad, mom, the kids and even grandma or non-divers, to the reef along with experienced scuba divers. He anchors in the shallow water on the backside of the reef where non-divers can stand on the sandy bottom and put on a facemask for the first time to watch the corals and reef fish with as much safety as if they were in a glass bottom boat. Snorkelers swim away in small groups, drifting on the surface and watching the amazing panorama of coral and moving marine life unfold beneath them. Scuba divers have only a short swim through a surge channel to reach the seaward edge of the reef where they explore and photograph some of the spectacular coral formations that have made Looe Key so special. More advanced divers can continue on over the wall into the beauty and mystery of the world of deep water corals and larger fish.

Thus, Looe Key has something for everyone. Families, beginners, fish watchers, photographers, and divers interested in reef ecology, will be compatible with the Sunshine Key Aqua Center. Divers interested in hunting fish, lobsters and shellfish should find Underseas, Incorporated, more to their liking.

Bahamas Reprints

Reprints of the First Complete Dive Guide to the Bahamas, which appeared in the July, 1978, issue of SKIN DIVER Magazine, are now available and may be obtained at no cost from the Bahamas Tourist Office, 255 Alhambra Circle, Suite 275, Coral Cables, Florida 33134, phone (305) 442-4860.

The 30 page comprehensive guide was prepared by Paul J. Tzimouis, Editor-Publisher of SKIN DIVER who spent two months touring the islands, diving the reefs, and interviewing dive resort operators.



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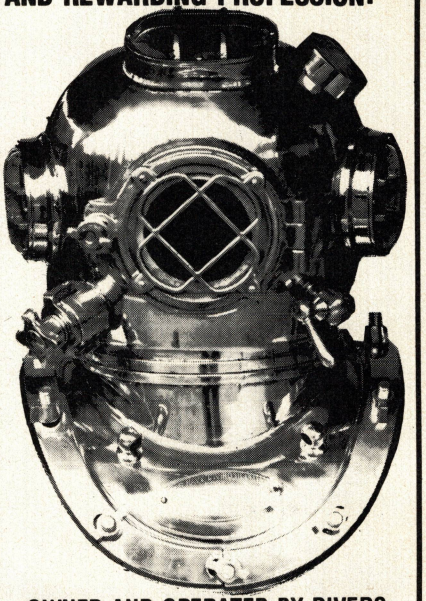

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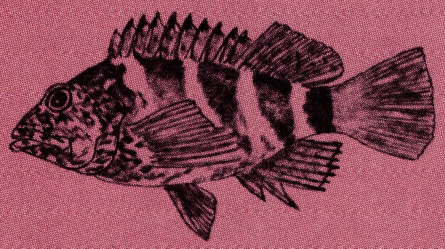
The Banded Hawkfish

(Cirrhitops fasciatus)

In Hawaii, hawkfishes are called *pilikoa*, which means "coral-clinging." This is in reference to their habit of living in coral, and staying with it even if the coral is taken from the water. It is not uncommon for a hawkfish to wiggle out on dry land after coral is brought ashore. The common name of the fish comes from its hawk-like habit of perching on top of a coral branch or ledge, waiting for prey. When a small fish or crustacean happens by, the hawkfish will swoop down, vulture-like, and grab its meal. □ The banded hawkfish *(Cirrhitops fasciatus)* is a colorful Hawaiian reef inhabitant, with five dark red vertical bands on its body, with the last band, on the caudal peduncle, being the darkest. There is an indistinct dark spot on the opercle. The white spaces in between the red bars are intersected by more red (the white parts looking like an upside-down "Y" toward the belly). There are also white spots about the head. □ The Cirrhitidae family of hawkfishes is very close to the Scorpaenidae, or the scorpionfishes, since they share many similar characteristics. They are both bottom fishes, never swimming around freely, but sitting on a ledge or on coral and moving only to dash for shelter, or to attack some chosen prey. They both have thickened dorsal fin rays, although hawkfishes do not have spines on the head, as do the scorpionfishes.



The pectoral fins of both families are strong and thickened; both hawkfishes and scorpionfishes sit on the bottom, propping themselves up on these fins to look around. Cirrhitids comprise a relatively small family of fishes, and are characterized by a fringe at the back of the nostril. Ichthyologists James Bohlke and Charles Chaplin suggest the possibility that hawkfishes are the link between the bass-like fishes and the scorpaenids. □ The banded hawkfish is found from Hawaii, Japan, Mauritius, and Madagascar. Ichthyologist John Randall points out that *C. fasciatus* is a synonym for *C. cinctus;* most references treat the fish under the *cinctus* label. *C. fasciatus* is very common in the Hawaiian Islands and is a bright, colorful addition to the reefs. It is a small fish, growing to a maximum of four or five inches. According to Randall, who studied the stomach contents of 18 specimens, the banded hawkfish feeds mainly on small fishes, shrimp and crabs, plus a small amount of planktonic animals — larval shrimp, copepods, amphipods and larval gastropods. Because this fish will hesitate to swim or scurry away from its outpost on the reef, it is fairly easy for the diver to approach it. As the banded hawkfish clings tenaciously to its chosen spot, the underwater photographer can carefully swim in for a close-up.

Photo By Chris Newbert - Text By Hillary Hauser

The photo was taken in 95 feet of water off Kailua, Kona, Hawaii. Newbert used a Canon F-1 with a 50mm macro lens in an Ikelite housing, Farallon/Oceanic 2003 strobe and Kodachrome 25. Shot at f16, 15 inches from subject.

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BY NANCY IRONSIDE

Any comparison between birdwatching, with its eccentric spinster, image, and scuba diving, the ultimate in machismo, may be too traumatic for SKIN DIVER readers to accept. Nevertheless, they are similar, and a knowledge of birdwatching ethics and rules might add a new dimension to your interest in scuba diving.

My first sight of the underwater world on the Andros reef was one of the great thrills of my life. The ecstatic feeling of buoyancy, of release from the world of gravity while surrounded by the beauties of the reef, was an exciting new experience. As my dive vacations extended to other Caribbean reefs, I learned to recognize the beautiful male fish with their dowdy females and their totally different juveniles, to watch for cleaning stations where the wrasses serve the larger fish, to watch the trumpetfish glide through the water on the currents of a grouper. The different corals took on names and I learned how to find eels, crabs and lobsters. When I looked in the crevices I saw the squirrelfish, noted that they differed, and tried to categorize them with the help of my fish identification book.

Many other scuba divers have gone this same route. Some become shell collectors, others take up photography, others look for wrecks and artifacts or bottles. Some become underwater archaeologists. I took up fishwatching.

Fishwatching, like birdwatching, is simply the identification of what one sees. The purpose of identification is mainly to increase a person's powers of observation and to communicate those observations to others. Most birdwatchers observe, identify, and list for their own satisfaction, but some have become sufficiently expert that they have contributed a great deal to our knowledge of birds' habits and their territories.

Scuba divers have contributed a great deal to our knowledge of the fish, but much more is yet to be learned. Are fish territorial? Do they mate for life — or do they mate at all? Do they migrate? Do storms bring strays to the reef? By ob-

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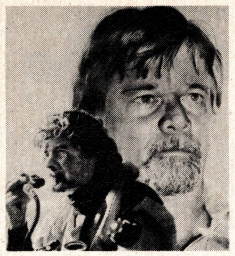

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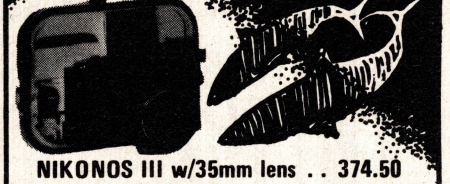

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UNDERWATER BIRDWATCHERS

servation, scuba divers may answer these questions, but they can also play the game of fishwatching.

Listing is a form of collecting without acquiring anything. It is the prerequisite of serious birdwatching or fishwatching. A birder might have a life list, a province or state list, a country list, a trip list, a winter list, a day list or any other list he or she happens to keep. This encourages the birder to identify all the birds he sees, as well as just the pretty ones, and is the basis for our knowledge of migration patterns and bird distribution. No one ever cheats on a bird list, for to cheat on one's bird list, is to cheat on one's self.

There are also intensely competitive bird listers. They have their names published in a special supplement to the magazine, Birding, and the names of the top listers are just as well known to them as Paul Tzimoulis is to scuba divers. The Cape Cod area frequently sees birders, who wish to increase their life list, flying from all over North America to see some European stray.

The competitive birder is a unique species, one which could not be found among fishwatchers at this time, because fishwatching is still in its infancy as a hobby.

Fishwatching lacks a Roger Tory Peterson. Because of his authoritative and comprehensive *Field Guide of North American Birds*, he is known as the father of modern birdwatching. The best liked fish book is the *Fishwatchers Guide to West Atlantic Coral Reefs*, by Chaplin and Scott, with 180 species. It has excellent illustrations, concise field markings and its waterproof pages allow you to take it on the boat, stored with your gear. Idaz and Jerry Greenberg's *Guide to Corals and Fishes of Florida, the Bahamas and the Caribbean* is useful for novice and expert alike. Randall's *Caribbean Reef Fishes*, with 300 species is more comprehensive and becomes more useful as one becomes more observant. SKIN DIVER Magazine has good illustrations and descriptions, and it is hoped that the Fish of the Month will be collected and published. There is an excellent book on the fishes of the Red Sea, published by the University of Israel but hard to buy in North America.

So far, I have been unable to find a comprehensive field guide for Pacific fishes, although the *Many Splendored Fishes of Hawaii*, by Gar Goodson, and *Fishwatchers' Guide to the Inshore Fishes of the Pacific Coast*, by Daniel Gotshall, are very helpful. The publishers of the *Underwater Fishwatchers Guide*, have promised a Hawaiian counterpart to the *West Atlantic Coral Reefs*, but it has not yet arrived on the bookstands. For

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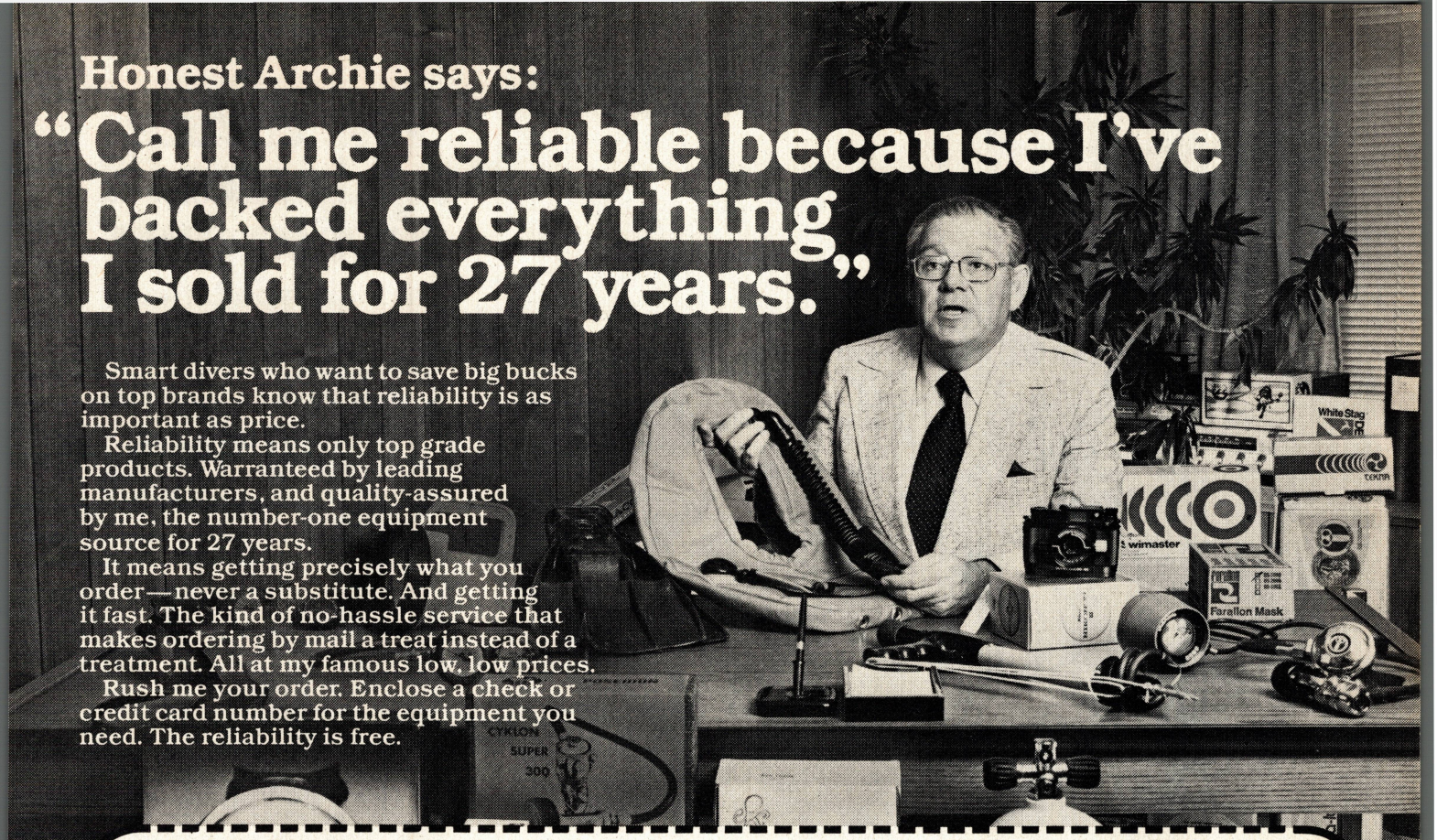

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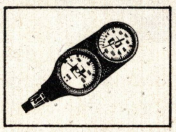

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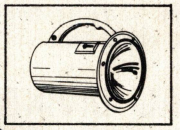

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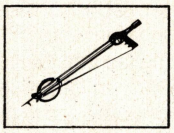

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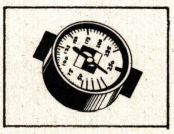

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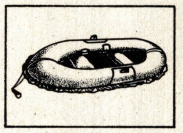

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UNDERWATER BIRDWATCHERS

some areas, definitive works are available, such as, *Freshwater Fishes of Canada*, 966 pages, published by the Fisheries Research Board of Canada. It describes 181 species, but it relies heavily on dissection of specimens rather than sight-identification by the scuba diver. Good books make fishwatching more fun and help develop the rules.

As with any game, fishwatching must have rules: some are set down by ichthyologists, and others of our own making. A fishwatcher must, of course, have a life list — a list of all the fishes he has ever seen. He then may make lists of fishes he has seen in the Caribbean, fishes in the Pacific, fishes in fresh water, and, of course, trip lists.

A list of fishes seen on the *Balboa* in Grand Cayman, or the *Rhone* in the Virgin Islands may be kept by some, and if a strange fish is sighted, it will be of interest to him and other fishwatchers. The depth at which certain species are found will also be of interest, as well as the times of the year. The challenges that one may set for oneself are endless.

To achieve a long fish list, one must learn to distinguish between the little brown fish, just as the birder can distinguish between the little brown birds. Indeed, a birder might become ecstatic over a Henslow's sparrow — a most nondescript little brown bird — if it were found in the wrong place at the wrong time. Naming and listing all the fish seen, entails a much closer look at such fish as gobies, blennies, pipefish and cardinal fish, than most of us usually take, but this may be rewarding as experience in fishwatching increases.

Unfortunately, if one starts fishwatching outside the Caribbean, Latin names become mandatory, since common names are either too variable or non-existent. This problem recurs when one gets more involved in the study of any area of our ecology. The mushroom hunters have a motto, "Mycologists have more fungi," however I think a lot of the fun is taken out of mushroom identification by the almost exclusive use of Latin names.

Resort divemasters are usually the best informed fishwatchers for their own reefs. Many that I have dived with do stimulate their divers' interest because they are knowledgeable and observant. If more people were interested in increasing their life lists, the divemasters would see that each diver had the opportunity of a night dive, with its completely different spectrum of life.

The divemasters could also keep check lists of fish that have been seen in their areas, and they might want to document these fish with photographs. Some new species on the fish list might remain hypothetical unless so documented.

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Enough interest might develop that the travel sections of dive magazines might publish a resort's fish list, or at least the rarities that might be seen there. If fish-watchers became competitive, some might travel to those areas in particular, to increase their total life list. Bird-watchers do.

Dive clubs might attempt inventories of the fish and other life seen in their usual dive sites — both salt water and fresh water. Annual fish counts, similar to the Christmas bird count, might have predicted lake pollution before the fisherman reported that the "whitefish aren't biting," and preventive measures might have been established earlier. Our local dive club members have noted a significant decrease in the crayfish in our nearest lake. Is this due to pollution, or to a cyclical change often found in nature? Only long term observations and records will tell. During the winter, underwater naturalists are invited to speak to our club. If we are not interested in the world around us, it may not be around when we want it.

Eventually a fishwatchers' organization, with a newsletter and purpose similar to the American Birding Association, might develop, "to promote the hobby and sport of fishwatching, to educate the public in the appreciation of fish and their contribution to the environment, to contribute to the study of fish in their natural habitat, and to contribute to the development of improved methods of population studies of fish." Ichthyologists and ornithologists appreciate the reports and identification inventories that they receive from well informed amateurs, and most field naturalist clubs are well supported by the professional naturalist. When all this happens, fishwatching will have arrived.

SKIN DIVER readers may wonder why I, a very amateur birdwatcher and fishwatcher, have the temerity to write this article. As with any other hobby, the more people who are involved, the more we learn of fish lore, the more fun fishwatching becomes.

STAN WATERMAN HONORED

The Academy of Natural Sciences in Philadelphia recently honored U/W photographer/explorer Stan Waterman with its Richard Hopper Day Memorial Medal, "for outstanding service in exploration and discovery in the natural sciences."

The Academy described Waterman as "a true naturalist, devoted to understanding the underwater world and portraying its thrilling excitement and its novelty to lay people of all ages."

Waterman commented by saying, "It is a singular honor for a skin diver and I am pleased and surprised to be the recipient of this medal." His film, *The Day of the Whales*, was shown following the presentation.

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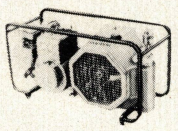

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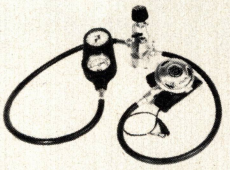

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SEA

Many people feel that turtles, unlike most of the reptile family, possess a great deal of charm with their sad, lonely faces. Of the five reptilian orders known to exist in the world today, the turtles are by far the most popular among humans.

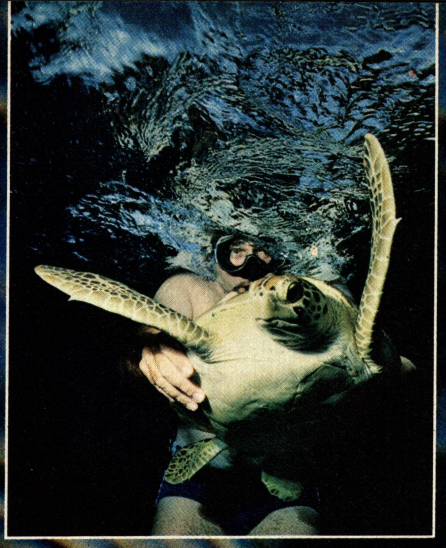
By definition, turtles are reptiles with bony or leathery shells. They have no teeth but instead are equipped with sharp, horny jaws. Turtles have four strong, clawed or flipper-like limbs and a tail. All turtles reproduce by internal fertilization and lay their eggs on land. The word tortoise is commonly used to refer to terrestrial turtles, those with high-domed shells and elephant-like feet. The term terrapin refers to turtles that dwell in fresh water and have pronounced webbing between their toes. Sea turtles are those totally aquatic creatures with paddle-like limbs and a flat, smooth, streamlined shell.

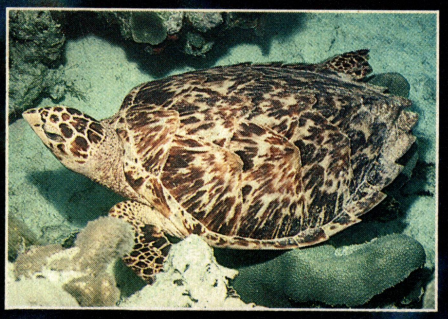
Of the more than 200 species of turtles in existence today, five make up the sea turtle family: the leatherback, the green, the loggerhead, the hawksbill, and the ridley. Except for the leatherback, sea turtles have a protective shell that encloses their body much like a suit of armor. The back shell, called the carapace, is made of tough, thick bone and is strengthened by a covering of scales. The undershell, called the plastron, is slightly softer but still protective. The leatherback has a unique shell consisting of pieces of bone embedded in the skin. The surface appears as a thick, dark brown leathery skin with seven lengthwise ridges.

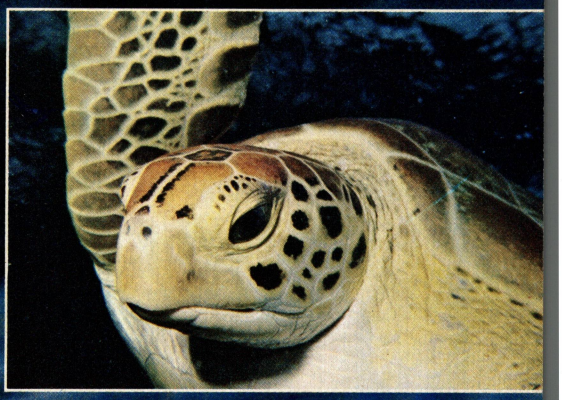
Sleek and graceful, sea turtles are capable of bursts of great speed. When there is a disturbance or threat, they can travel as fast as 300 feet in ten seconds. The front flippers move up and down much like the movements of a bird's wings, making them look as though they were flying through the water. Their hind flippers are used as rudders.

Sea turtles breathe air and are highly accomplished breath-holders. In addition to drawing air into their lungs at the surface, they use their mouth cavities as a sort of gill. As water is drawn in through the nasal openings, dissolved oxygen is isolated and absorbed within the mouth cavity; the water is then expelled. At rest, turtles have a relatively low oxygen requirement and are capable of long periods of non-respiration. Studies indicate that the green sea turtle can remain submerged for as long as five hours.

Although turtles lack teeth, their jaws are sharp and powerful, acting much like a pair of curved scissors. The hawksbill turtle (also known as the tortoiseshell turtle) is recognized easily by the feature that gives it its name: The upper jaw hooks down and over the lower one like a hawk's or a parrot's. Although all the sea turtles have some-







TURTLES

Roaming Reptiles of the Deep

thing resembling a hooked beak, the hawksbill is distinguished by the narrowness of the anterior part of the skull.

Eating habits vary from species to species and according to growth. The green sea turtle is predominantly vegetarian except in the first year or so after birth. As a result, green turtles are usually found in shallow, grassy areas. They eat sea grass to such a great extent that it has become known as turtle grass. This turtle is named for the greenish color of the fat stored inside its body. Females of the species have traveled 1400 miles, surviving solely on this fat.

The hawksbill turtle begins to eat grasses immediately after birth but as it matures, will eat marine invertebrates. Crustaceans, mollusks, sponges, and jellyfish are consumed as well as some plants. Usually seen in shallow coastal waters, the hawksbill searches for food around rocks and reefs.

The loggerhead will eat marine grasses but definitely prefers meat. Its diet includes sea urchins, shrimp, jellyfish, oysters, mussels, crabs and fish. Loggerheads are generally much more aggressive and alert than other species and have been seen in the open sea as far as 500 miles from the nearest land.

The ridley sea turtle is carnivorous, feeding largely upon mollusks, crabs, jellyfish and sea urchins.

The leatherback feeds on fish, jellyfish, octopus, seaweed and algae.

The marine turtle is agile in the sea but awkward on land. Coming to shore under the cloak of night, the female drags the tremendous weight of her body onto the beach to lay her eggs. Above the high tide mark she digs a hole using her hind flippers as scoops. The pit, when completed, is about 18 inches deep and serves as the nest for her eggs. In about two hours she lays anywhere from 60 to 200 white leathery eggs, which look like ping-pong balls. When finished, she fills in the nest with sand and continues to scatter sand as she returns to the water, thus obscuring the location of the nest. The duration of incubation varies with the site of the nest and the season and ranges from 30 to 65 days.

Even before birth, the turtle is hunted by numerous predators. During the incubation period many eggs are eaten by wild dogs, skunks, racoons, and ocelots. Humans also take eggs which they eat or preserve.

Baby hatchlings also face many dangers. Taking the shortest route to the sea, they fall victim to herons, gulls, and crabs as they scurry frantically toward the water. The majority don't survive their first day. After entering the water, they face dangers from carnivorous fish including mackerel and sharks.

In one year the surviving hatchlings may grow to weigh from 10 to 20 pounds. Turtles reach maturity in six years and are then able to reproduce. Adult turtles' only natural enemies are sharks, killer whales and man. It is no secret that human exploitation has caused the near extinction of the sea turtle. Hunted for its meat and its fat for soup, tortoiseshell for jewelry, hide for leather goods, eggs for cooking and oils for soaps and creams, the sea turtle has become an endangered species.

In recent years, however, much has been done to save the sea turtle. Conservation groups have established hatcheries to protect the eggs from animals and hunters. Laws have been enacted limiting the number of turtles that may be caught. Gradually, the population of sea turtles is again increasing. The peaceful, shy sea turtle has existed for 200 million years. Hopefully, with the new attitude toward the preservation of this benevolent reptile, it will swim with us for the next 200 million.

Text and Photography by Geri Murphy

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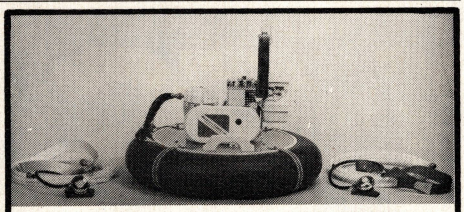

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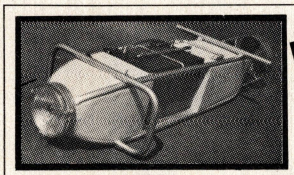

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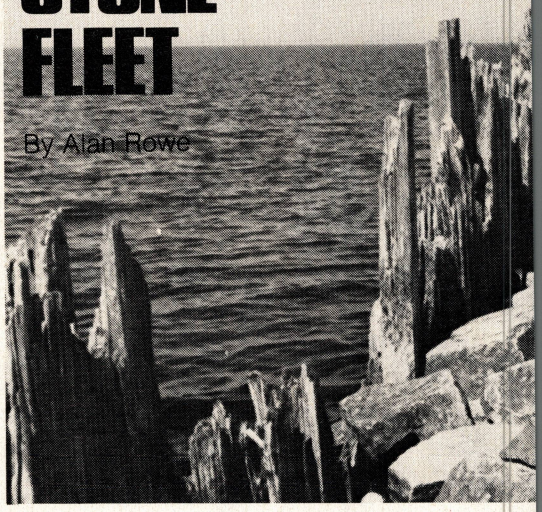
WISCONSIN'S STONE FLEET

By Alan Rowe



Every year, hundreds of Midwest divers head for Wisconsin's Door County peninsula. There they seek the abundance of deep water shipwrecks that lie scattered about Lake Michigan.

Weekends promise adventure and hopes of bringing back some memento. Sunken relics lure both clubs and individuals to fly the divers flag, somewhere along this inland coast.

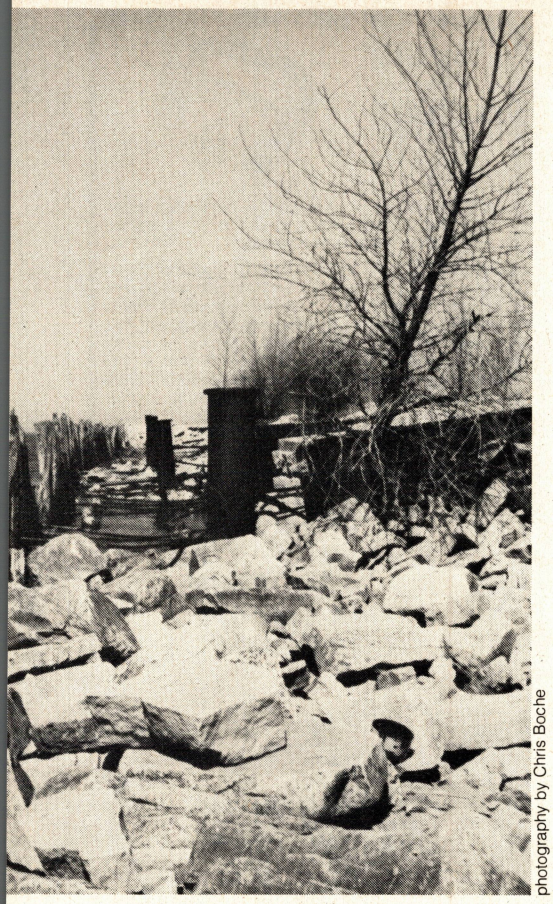
Surprisingly, most divers pass right by a virtually unnoticed shallow water sanctuary, one that harbors the remains of more than 20 decaying ships.

The only known group of vessels to comprise Wisconsin's old stone fleet rests on the bottom of Sturgeon Bay, Wisconsin. Although they spent their last years as stone barges, they were once proud schooners and lake steamers. They sailed the Great Lakes during the 1800's.

With the discovery of Niagara limestone in the year 1843, the slopes surrounding the bay were carved out by newly formed rock quarry companies. They needed means of transporting stone throughout the Great Lakes region and thus acquired ships previously declared unseaworthy.

After removing the upper structures and dismantling the cabins, the hulls were converted to carriers. No longer would carefree passengers promenade about their decks. The sole existence for these barges was to carry rock from the quarries to distant ports.

When the depression years arrived,



photography by Chris Boche

Remains of stone ships lie in the shadows of this abandoned wharf in Sturgeon Bay.

the quarries closed down, and the abandoned barges were left moored to rickety old docks.

Today, several of the hulls still retain their last cargoes. Some remain nameless, their identities lost in time. The weekend relic diver can find a time capsule in any one of these wrecks. Brass engine parts, steam valves, and piles of iron ship spikes lie scattered among the waterlogged decks. Old bottles and assorted personal items from a past history are not hard to find.

Most of the wreck sites are located just offshore, providing easy access. Depths range from 15 to 40 feet. Some of the barges are in fairly good shape, allowing a close examination of how staunch wooden vessels were built before the days of steel plate and rivots.

Adding to the excitement for sport and wreck divers is the fact that the hulls can be found in clusters. It is fascinating to see several bows in close proximity.

Ten of the wrecks we explored were at the sites of abandoned loading docks, once owned by the stone quarries. The docks, composed of earth and rough wood timbers, extended out into the bay. These long fingers of land were built to allow deep drafted stone scows to be loaded with heavy, massive slabs of limestone.

Nine empty pits now scar the bluffs around the bay. They are mute testimony of an industrious period of the area. During the height of rock quarrying in Wisconsin, the Sturgeon Bay companies maintained separate groups of stone carriers. Locally owned steam tugs pulled consorts of barges up and down the lakes. Between the years 1896 and 1920, their activities paralleled the growth of the rest of the country. An increased tempo of government building projects in the states of Michigan, Illinois, Wisconsin, and Minnesota kept the fleet in continual operation. At one time it consisted of over 27 vessels.

When the golden age of stone died, quarry derricks and steam drills went quiet. The ground no longer trembled from subterranean blasting. Both laborers and their horse teams had gone home. The once flourishing stone fleet and the docks that served it went still.

Later, barge decks began to rot, riggings were stripped away, and winter ice took its toll. Wooden hulls, weary with age and years of battling the elements, sunk into the shallows of Sturgeon Bay.

The stone fleet is very inviting. Oaken ribs are guides to underwater graves that beckon divers who search for excitement. The bay and her sunken residents are protected from adverse wind and waves. High ridges rise up around the bay, shielding it from heavy weather. A diver need not worry about rough water, as a lee side is usually available.

The numerous coves around the shores have also protected the barges

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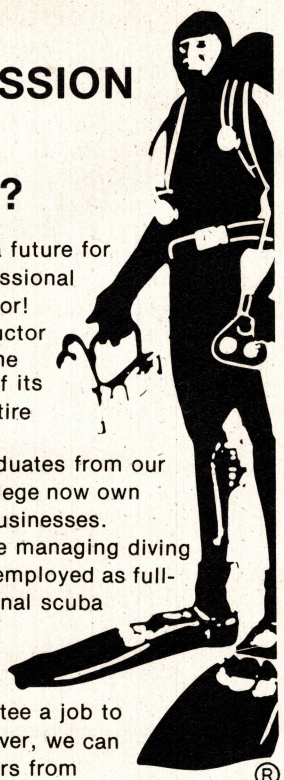

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STONE FLEET

from being broken up. They have been gone a long time but their existence is remembered by a few old timers, fishermen, and some local divers.

Sturgeon Bay is located at the entrance to Door County. On the Wisconsin state map, the Door peninsula appears as a thumb of land, extending out into Lake Michigan. A bay and ship canal slice through the thumb at its base, about 20 miles north of Algoma. Highways 42 and 57 go through the city which is set directly on the bay with the same name.

What makes diving on the stone fleet so pleasurable is its accessibility. Most of the barges can be approached by diving from shore. Cars can be parked within a short distance, and many of the wreck sites are adjacent to public property, or can be gotten to with permission from private land owners.

Each hull, or group of hulls, lies near a quarry. Both sides of the bay have roads that follow the shoreline. Divers should have no problems in finding the quarries, as they are all situated along the shore roads. Local residents can direct divers to particular dive sites.

Boats are needed for vessels that lie farther out in the bay. Launch ramps are provided by the Sturgeon Bay park system, with either no charge or a small fee. Local charter boats service the bay, Lake Michigan, and Green Bay waters.

Air fills, quality equipment, and marine charts may be obtained at a nearby dive shop right in the city. The shop is also a source for information about any diving in the area. Another source for air, gear, and lodging is at a dive shop found by a town called Gill's Rock, 40 miles up toward the end of the peninsula.

The Sturgeon Bay museum and library have collections of historical documents that tell about the stone fleet. Photographs are available that show steam and sail barges in their prime. A recently added marine museum houses an historical exhibit, depicting the famous shipbuilding industry of the region.

State park campgrounds and modern motels offer both overnight and weekend accommodations, all within view of the wreck sites. But be warned, for once you've visited one of the wrecks, you'll beg to stay and explore all the rest. Each barge is as individual as the original ship from which it was converted.

For those divers who prefer to search the shallower waters of Lake Michigan, Sturgeon Bay and its resident fleet offer the chance to explore an important segment of our state's nautical heritage. Those divers who have dreamed of finding a shipwreck in the warmer, more inviting shallows, need not search farther. The fleet is in, it has been since 1920. It waits for you.

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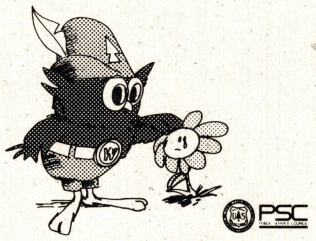

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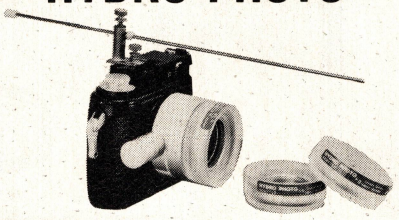

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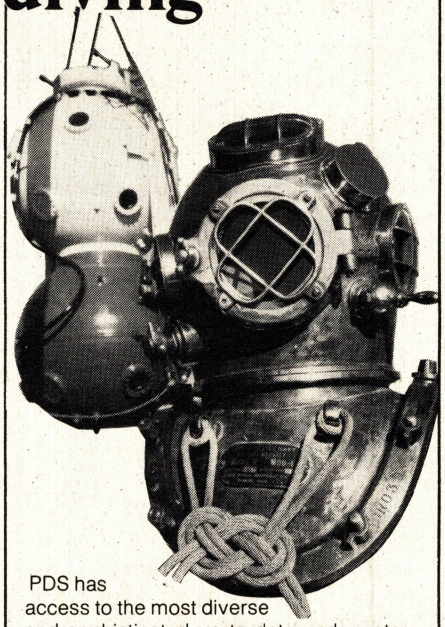

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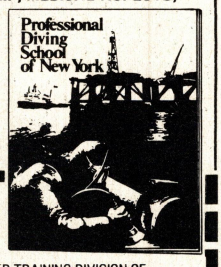

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DIVE LENSES

Skin and scuba divers may soon be able to get one step closer to fish — they won't need a mask, just an unusual pair of contact lenses.

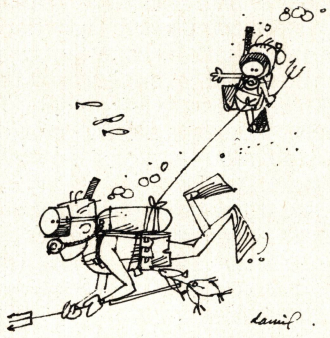
The unusual contact lenses are being refined by optometrists Drs. Dale Rorabaugh and A. Harry Malin of Pacific Beach, Calif. Only a close look at a diver's face reveals the secret to this new U/W freedom. The entire front of the person's eyes are covered by a large soft contact lens. In the center of the lens, covering the pupils, are small plates. It is this plastic panel and the tiny air space behind it which allows a diver to see clearly under water.

Optometric testing shows that the unusual lens reduces a diver's field of vision by only 12 percent, whereas a conventional mask causes a 45 percent reduction. Rorabaugh believes that divers whose work calls for unobstructed vision will be the first to use the lenses on a regular basis.

Underwater contact lenses are not a new invention. They were first created in the early 1950s and further tested and improved in the late 1960s and early 1970s. The lenses did not gain widespread popularity for several reasons. First, they are expensive: from $500 to $1,000. Second, modification of the regulator second stage is necessary to keep exhaled air from bubbling across the diver's eyes. Another disadvantage is that special care is required to slip the lenses into place and to remove them. However, the contacts do not fog as a conventional mask will. Some divers also have difficulty adjusting to the small amounts of salt water which flow through the porous lenses and irritate the eyes.

But, in spite of the disadvantages, diving contact lenses offer some worthwhile advantages. They can be correction ground just like ordinary contact lenses. They do not fog. They offer a wide range of vision. They are more stable than a mask in turbulent water. And, with no mask on, there is no problem with mask squeeze while descending. Without a mask, clearing the ears by directly pinching the nose is also easier.

For further information, call Dr. Dale Rorabaugh at (714) 272-2213.



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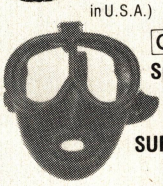
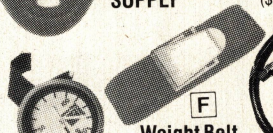


C **Full-Face Mask Special Sale $34.95 LIMITED SUPPLY**



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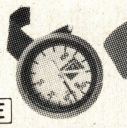

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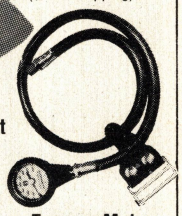

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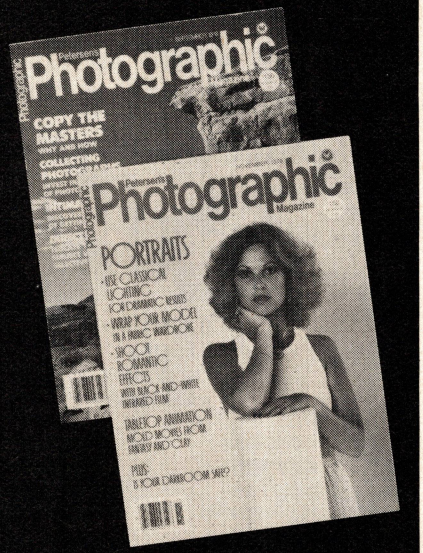

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REGULATOR REPAIR

(Continued from Page 59)

sidual air bled off, the repairman draws hard to uncover any hidden leaks.

On the test bench, the regulator is now checked for effort required to inhale and exhale. More than three-quarters to one inch of water pressure in exhalation effort, and more than one to one and one-half inches water pressure in inhalation effort is not acceptable by present standards. The precise maximum acceptable effort varies from regulator to regulator, according to manufacturer's specifications. The manufacturer's repair manual often specifies a flow volume each regulator should achieve. These tests should be made at both maximum and minimum working pressures.

All O-rings are to be silicone lubricated in reassembly, but excessive lubrication must be avoided. The best method entails coating the fingers with silicone paste and rolling the rings between the fingers as they are inserted.

When the first stage is reassembled, all mating metal surfaces are wiped with a thin film of silicone and the high pressure seat is replaced or reversed. After the new O-ring and spacers are placed into the bonnet, the paste-coated piston must be inserted in a gentle, rotating motion to avoid damage to the O-ring by the machined piston feather edge.

Most piston regulators contain Teflon wiper rings on either end of the piston shaft to prevent sand and dirt from entering the ambient pressure ports and damaging the piston shaft O-rings. These wiper rings must be replaced in the positions closest to, or facing each other, or they become useless.

After the high pressure spring and any shams are reinserted, the body cap is screwed on carefully. Most regulator metal parts are chrome plated brass — easily damaged by over-tightening. O-rings are also subject to damage from excessive tightening.

In the case of regulators with low pressure swivels, a metal circlip will have been removed for replacement of the O-ring inside the cap. Circlips are made in part from spring steel, and must be replaced — not cleaned — if rusted. Circlip failure leads to regulator failure.

The whole process of repair and maintenance of your regulator is probably much more complicated than you might have thought. It takes a highly skilled technician and a large investment in equipment to do the job properly. Regular service on your part will prolong the life of your regulator and keep it working at factory specifications for as long as you dive. If you are wondering about your regulator after reading this article, take it down and have it looked at. Chances are it will cost you less and be done faster than you expected.

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TRAVEL AND THE NOVICE DIVER

By Ken Smith

A novice diver off to some faraway resort for his first dive vacation has a deep secret. He's first aware of something odd before he takes his first dive; perhaps he recognizes it midway through the cocktail party on the night of his arrival. His excitement about tomorrow's dive wanes, his mind wanders, his heart flutters. He tells no one. Later he suspects he has a touch of the flu. In bed he'll fall asleep quickly, only to awaken long before dawn and wonder why. When the sun rises he'll be exhausted. His stomach remains unsettled. He'll consider cancelling his first dive. He just isn't well.

Jet lag? Montezuma's revenge? Tropical fever? Nope. For novices — and for people who have been out of the water awhile — it's simply the pre-dive jitters. One time or another it hits just about every diver.

It's normal to be a little unnerved about a new dive experience, but it's important to recognize those butterflies are an indication that more practice is needed to become a confident and safe diver.

Actually, jet lag may have some effect on a diver's emotional state if he travels through several time zones. Wise travelers slowly phase into the new sleeping schedule and avoid heavy drinking and eating during the first few days. Excesses only aggravate the symptoms of pre-dive jitters.

The fear of what lurks below the surface is the least rational contributor to the jitters. It is rare for divers to see sharks and if a shark does appear, it usually scoots away at first sight. As to other enemies below, it is Pogo who has wisely said, "we have met the enemy and he is us," for the biggest problem the novice diver faces in new water is his own lack of skill and self-confidence.

Upon arrival the prudent novice tells the divemaster of his relative inexperience and asks for special consideration. Any divemaster worth his snorkel will see that the novice gets the proper introduction into new waters. Perhaps a pool lesson or a refresher course can be arranged. A dive off the beach may prepare one for more adventuresome boat diving. Or, an easy, shallow dive off the boat might ease anxiety and get the inexperienced diver off to a relaxed start.

If you're a novice, you can kill off a few butterflies by taking special steps. Before your first boat dive, make sure all your gear is properly adjusted. For example, now that you're not wearing your wetsuit hood have you adjusted your mask strap? Having to get your gear fitted on the boat can force you to rush; rushing can produce anxiety and that can lead to greater problems. Once dressed, carefully check your gear and your buddy's gear and ask him to do the same for you. Practice hand signals with your buddy. And don't complicate this first dive by taking along a camera, a light or extraneous gear.

When the divemaster delivers the pre-dive plan, stop whatever you're doing and listen carefully. Ask questions if the plan is unclear or if you haven't gotten information you need. For example, if the recommended technique for entering the water is unfamiliar to you, ask the divemaster for brief instruction.

If you are uncomfortable with any element of the dive plan, tell the divemaster. For example, if the first dive of the day is 100 feet and you've never been beyond 50, tell him for you 100 feet is too deep the first time out. He should be able to respect your limits today, and help you go deeper tomorrow — if you want to.

When a divemaster knows your needs, he won't suggest you do anything underwater that makes you unnecessarily uncomfortable. As your confidence and skills grow, you'll have plenty of opportunities for the more adventurous dives.

Although you must depend upon your divemaster to introduce you to new dive experiences, you should depend upon yourself to monitor the time and depth of your dives and to stay away from decompression. Plot your own dive profiles and, if the dive guide believes you can push your dive farther than your figures indicate, follow your own computations. Guides, too, can err in computing dives on the tables and no guide can keep track of everyone's depth and bottom time. This means, of course, that you must have your own calibrated depth gauge, a watch, and a set of dive tables aboard the boat.

The key to overcoming pre-dive jitters is to not keep them a secret. Divemasters and dive guides are employed to help. When apprised of your inexperience, they'll help you go at your own pace and develop your skills and confidence. That's what a safe dive vacation is all about.

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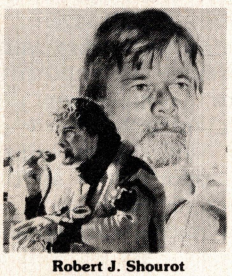

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DIVING IN MARTINIQUE

When Christopher Columbus discovered Martinique in 1502, little did he know that there was yet another world literally under his feet waiting to be discovered. Except for exploration by a few local divers, the island's underwater world has until now remained "virgin diving."

Unlike her neighbors in the Caribbean, Martinique in the French West Indies was a late bloomer to the world of tourism, but is today emerging as a new scuba destination. There is such a variety of underwater life at comfortable depths that first-time or novice divers can't help but become scuba diving enthusiasts.

Experienced divers, well acquainted with the Caribbean's other prime diving islands, are pleasantly surprised and impressed with Martinique's diving, giving it very high ratings. Living coral reefs covered with a colorful variety of sponges, coral and plant life and surrounded by an abundance of reef fish can be easily explored by the sport diver. Conservationists will be pleased to note that these waters are protected under government regulation to ensure their preservation.

Dive centers are located at the Latitude and Meridien Hotels and at Buccaneer's Creek Club Med. The Latitude Hotel is located about one-half hour's drive north of the Fort-de-France at Carbet, where Columbus first landed. An informal vacation village surrounded by a tropical park, it is a convenient set-up for divers.

The dive center here is operated by French licensed scuba pro Pierrick Billard, along with his wife Monique and brother Andre, both divemasters. A wide variety of dives can be made from nearby coves and beaches just a short boat ride away.

To the south, Meridien Plongee is convenient for guests staying at any of the hotels in Pointe du Bout, the island's major resort area located across the bay from Fort-de-France. Twice a day, French licensed scuba pro Bernard LeGrand and his two assistants organize two and one-half hour excursions to any one of several sites along the scalloped coast, such as Anse d'Arlet or Cap Salomon, about one-half hour away by boat.

Both scuba pros speak English and have French tanks and equipment available. The cost of a single dive at both centers is 120 francs (about $27), including all equipment, with reduced weekly rates available.

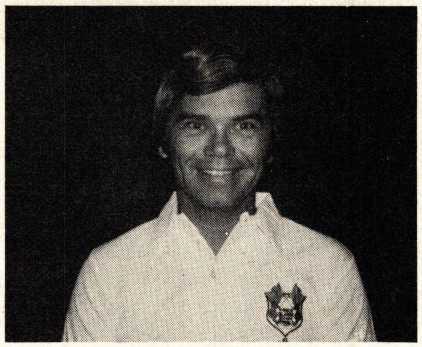
Among the sport facilities offered in its weekly package, Buccaneer's Creek Club Med runs a scuba diving school for its members. They explore

the reefs around Ste. Anne, at the southern tip of Martinique where the Club is located.

For information on diving in Martinique, contact the French West Indies Tourist Board, 610 Fifth Ave., New York, NY 10020.

PHILP TO ST. THOMAS

Peter M. Philp, formerly of Don Stewart's Bonaire Aquaventure, Bonaire, and Teach/Tour Diving Co. in Tobago, has joined Virgin Islands Diving Schools in St. Thomas, USVI.



Philp brings to Virgin Islands Diving Schools his resort skills which will complement a staff of 14. Tours, classes, equipment sales, rentals, repairs, and air are all available.

For information, write: Virgin Islands Diving Schools/Supplies, Inc., Department "P", P.O. Box 9707, St. Thomas, USVI 00801.

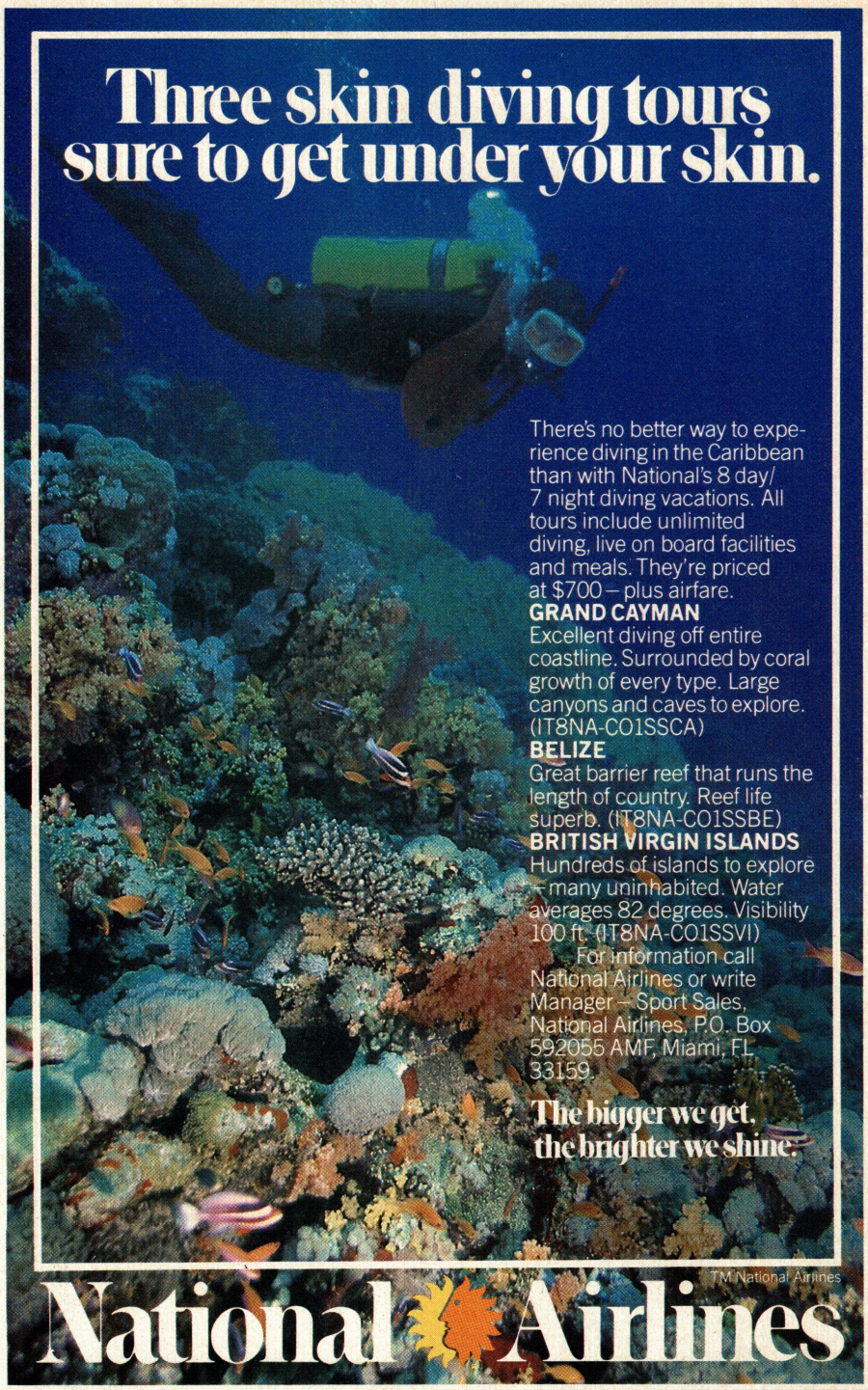
SEAQUATIC OPENS NORTH CAICOS

Seaquatic Divers has opened a diving facility at the Prospect of Whitby Hotel on North Caicos in the Turks & Caicos Islands. The operation will be run by two diving veterans, Mike Hogg and Allan Gardner. The Prospect of Whitby Hotel is a modern beach front hotel built in 1974. With its 25 air conditioned rooms, it is the largest hotel in the Turks & Caicos Islands.

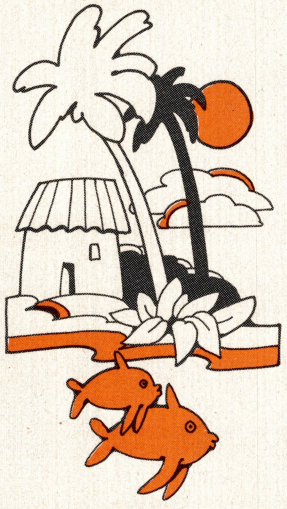
The operation is equipped to handle up to 25 divers at a time. Equipment includes a Worthington 20 cfm compressor, a Mako 4 cfm compressor, and 50 aluminum tanks. To get the divers to the dive sites, usually less than 20 minutes away, there are three dive boats: a 34 foot Seadeck designed especially for diving, a 17 foot MFG, and a 20 foot Avon. Unlimited diving packages are offered with boat dives twice a day: a two tank dive in the morning and a one tank dive in the afternoon. There are PADI, NAUI, and YMCA certification programs.

North Caicos has more than 15 miles of virgin reefs, including the dramatic beauty of the great wall dropping down 6000 feet, and some of the most spectacular shallow reefs in the world.

For information contact: Seaquatic Divers, R.D. #4, Box 1044, Middletown, NY 10940.



Divers Directory



Advertising rate is $70 for three consecutive ads, $120 for six consecutive ads, $185 for a full year. PAYMENT MUST ACCOMPANY COPY. Send all material to Diver's Directory, c/o Skin Diver, 8490 Sunset Boulevard, Los Angeles, California 90069.

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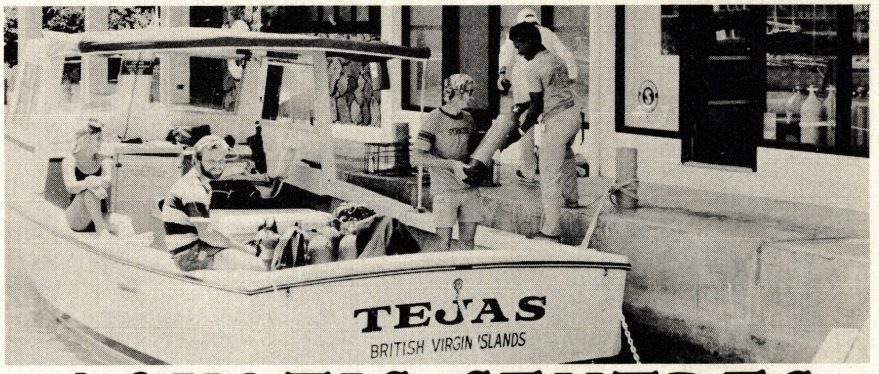

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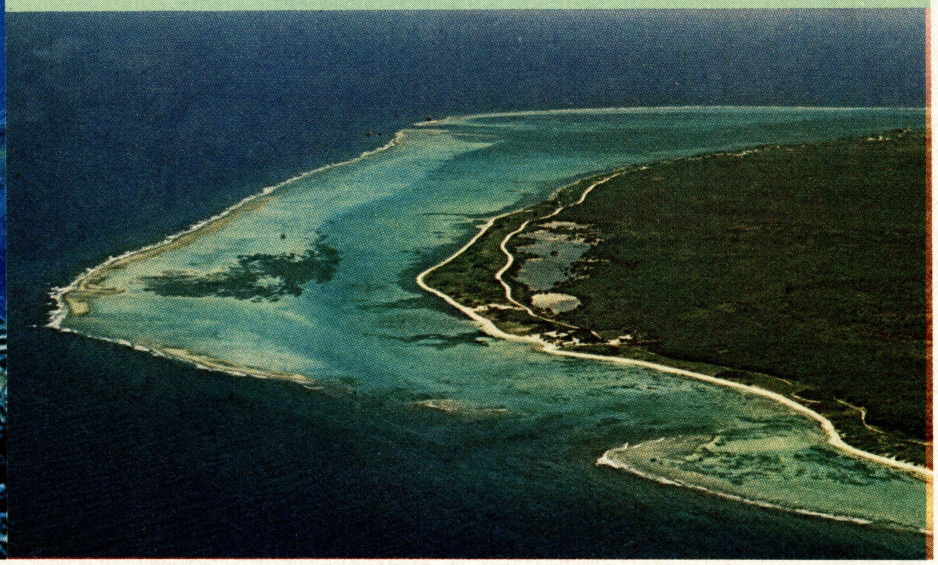

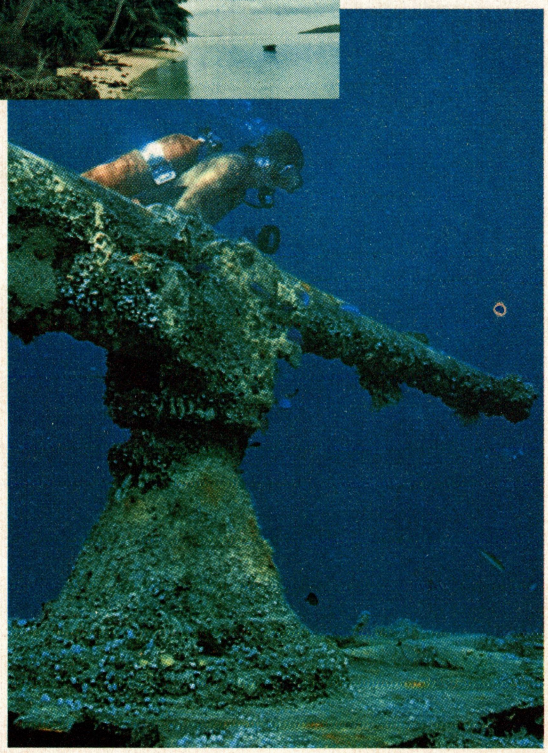

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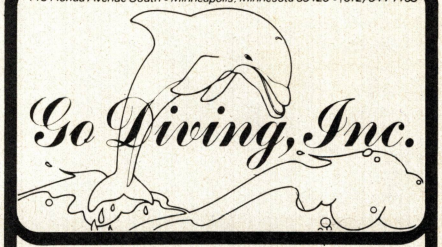

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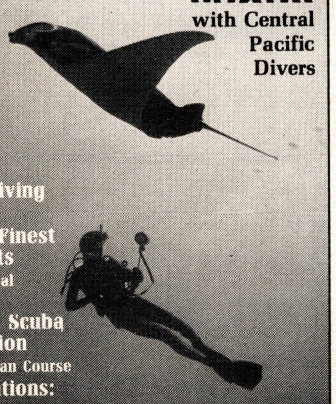

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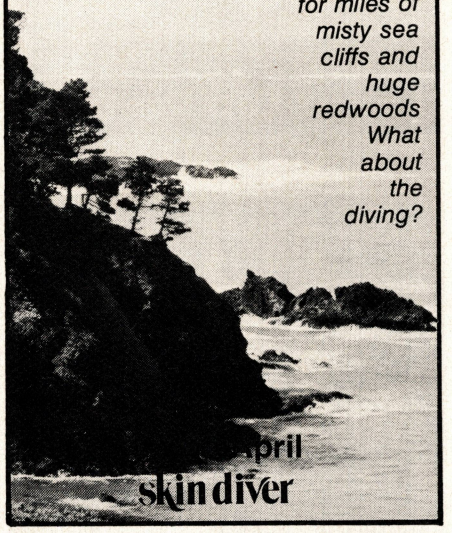

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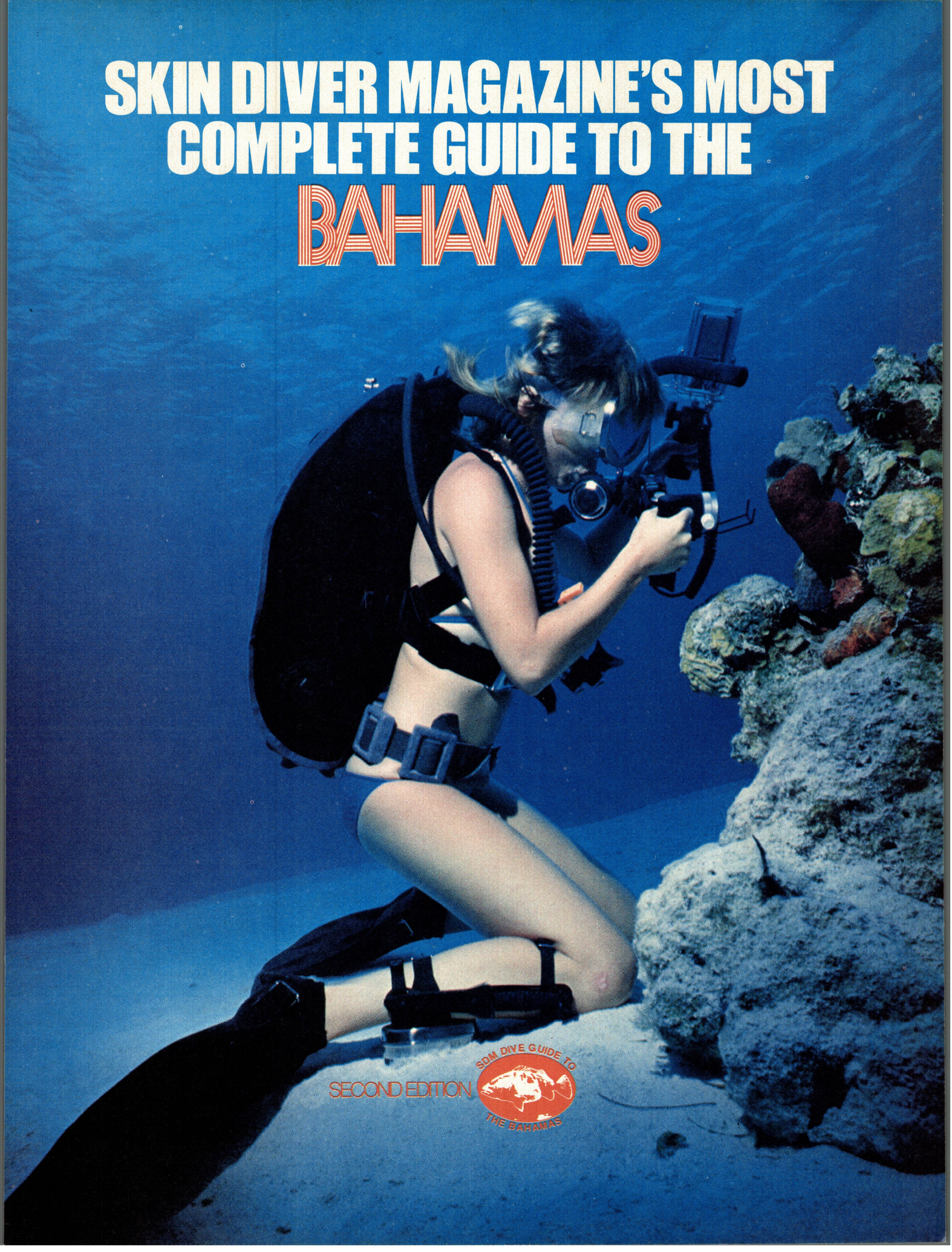

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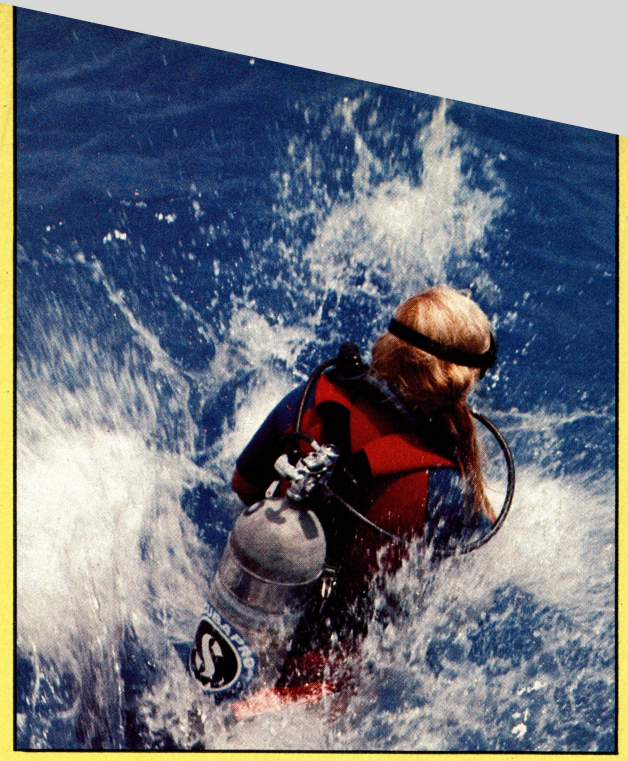
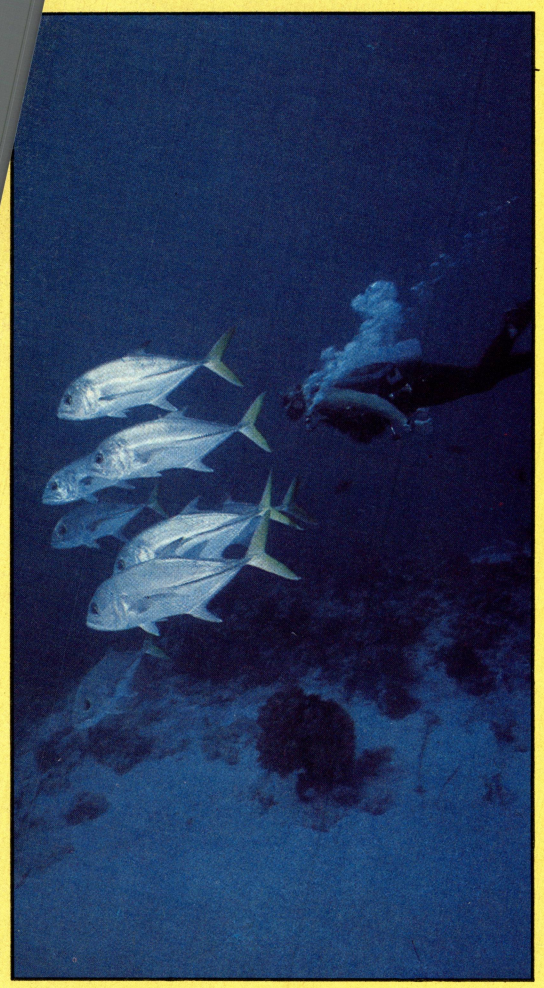




SDM Rates 25 Dive Resorts

By Paul J. Tzimoulis

Like some giant Milky Way spread across the deep blue space of the Atlantic, the Bahamas stretch across 750 miles of tropical ocean. They are a veritable galaxy of islands, encompassing 700 parcels of land and more than two thousand coral islets and rocky pinnacles. Less than one-third of this vast archipelago is inhabited by man and much of it has not been explored or accurately charted.

Those islands of the Bahamas which are inhabited are similar to planets drifting in space. Each is a world unto its own with a separate and distinctive culture, a different setting and even a different tempo. The islands of the Bahamas come in a variety of different sizes, unique shapes and varying population densities. There are even different dialects among the citizens of these isolated worlds. Contrary to popular belief, the Bahamas are not one homogeneous nation but instead a conglomerate or family of islands. It is these differences which make the Bahamas eternally fascinating to vacationing travelers.

Scattered among these coral cosmos are some 25 dive resort operations on 18 separate islands. They represent the largest cluster of dive resorts to be found in any country of the Caribbean, yet they are spread out over such a wide area that they are hardly noticeable. In fact, they are spread out across some 400 miles of ocean, ranging from Walkers Cay in the northern Abacos to Crooked Island in the deep south.

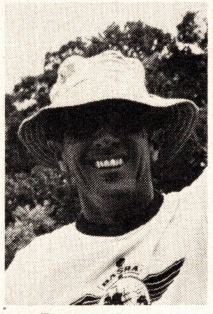
PHOTOGRAPHY BY PAUL J. TZIMOULIS AND GERI MURPHY

BAHAMAS

Less than a handful of divers have ever visited all of the dive resorts in the Bahamas, and these fortunate few are mostly private pilots island hopping with their own aircraft. It would take years for the average vacationing diver to accomplish such an ambitious task, and yet it is difficult to formulate a true picture of diving in the Bahamas without doing so. The scuba facilities, dive services, and types of diving span an incredible range. Each resort operation is as different and unique as the individual running it.

During the last year, SKIN DIVER Magazine was able to visit and interview each of the dive operations in the Bahamas, through the courtesy of the Bahamas Ministry of Tourism. The following are our brief impressions of these individual dive resort operations and the services they offer.

ISLAND MARINE
Abaco



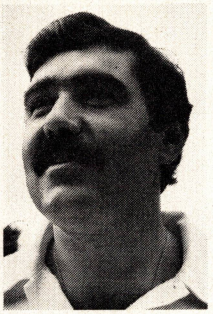
David Gale

Developed and managed by David Gale, Island Marine is an unusual combination of an independent dive shop operation and a marine outboard repair center. Gale stocks parts and works on Evinrude and Johnson motors. The business is located on a tiny island called Parrot Cay, which is situated close to Hope Town Harbour. Dave purchased the island from the Queen of England many years ago and has since carved out of solid rock a picture book marina and dive shop facility.

Dave is the resident diving expert as he has been diving the Abacos for more than 24 years. He is a certified NAUI instructor and conducts resort introductory scuba training and half-day dive trips for small groups of two to five. His main business is the rental of tanks, boats and air fills to experienced divers. He maintains a fleet of 12 rental Boston Whalers complete with outboards, and keeps on inventory a minimum of 50 rental tanks. He also works closely with the Abaco Inn, a small 10 room hotel on Elbow Cay. Jerry Whiteleather, manager of this hotel operation, is also an avid scuba diver and is happy to cater to divers visiting the area.

Undersea attractions in the Hope Town area are mostly shallow to medium depth coral formations of exquisite beauty. There is also an unusual Civil War wreck known as the *U.S.S. Adirondack* complete with two giant Dahlgren cannons.

CHAMBERED NAUTILUS
Abaco



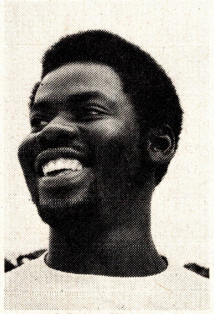
Dan Wiltfang

Located at Marsh Harbour, within a few minutes drive from the airport, the Chambered Nautilus is a small but efficient full service dive shop operated by Dan Wiltfang. It is situated on the grounds of the Conch Inn, a combination hotel/restaurant/marina which caters primarily to boaters and fishermen. The major portion of Dan's business is the rental of scuba tanks, pumping of air fills and providing helpful information about local dive spots. Dan also conducts personally escorted dive tours both by van and boat. He has several favorite inland blue holes which offer a unique scuba experience and are very handy when sea conditions are rough. His latest acquisition is a 24 foot dive boat for trips to nearby coral reefs.

At present, the Chambered Nautilus is a one-man dive operation. Dan is originally from Iowa and first came to Marsh Harbour in 1973. He is a certified PADI instructor and dabbles a bit in underwater photography. His favorite passion is tinkering with undersea submersibles, and he is presently working on an 18 foot, two-man aluminum wet sub.

As with most of the Abacos, dive attractions in the Marsh Harbour area are generally shallow to medium depth coral reefs ranging from 8 to 50 feet. The coral formations are exceptionally beautiful and there is a great deal of small tropical fish life. There is also a national underwater park and of course the wreck of the *Adirondack*.

WALKERS CAY DIVE SHOP
Abaco



Nick Rolle

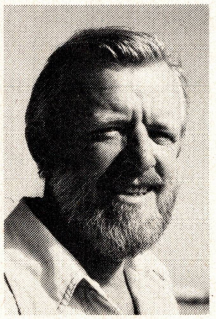
Situated at the very top of the Bahamas, Walkers Cay is a compact, self-sustaining island resort. The whole operation sits on a remote, two acre island, barely large enough for an airstrip, hotel, tennis courts and a large marina. For years, Walkers Cay was basically an exclusive resort for big game fishermen and yachtsmen. A dive operation was started in March, 1977 in an effort to expand the watersports services.

Located at the marina, the Walkers Cay Dive Shop consists of a heavy duty air compressor, 78 scuba tanks and two dive boats. This facility is basically for Walkers Cay guests but also accommodates visiting yachts. The majority of business consists of two-hour dive trips to nearby reef sites which are only 5 to 10 minutes away. Upon request, arrangements can be made for an all-day dive trip to the site of an authentic Spanish galleon wreck 22 miles from the marina. The *San Juan Evangelista* wreck lies in 33 feet of water, with old timbers, ballast stones and ancient cannons still visible. On occasion, Walkers Cay also hosts larger groups of 10 to 20 divers organized by Omorka Ltd. of Atlanta.

The dive shop is under the management of Nick Rolle, resident divemaster and scuba instructor for Walkers Cay. Nick has been diving since 1971 and has worked at various Bahamas dive resorts in the past. Nick is a certified NAUI assistant instructor as well as PADI certified.

The majority of the dive spots around Walkers Cay are shallow to medium depth coral reefs in 10 to 50 feet of water. There are also splendid coral caves, winding reef tunnels and fascinating coral canyons. The area is best known for its spectacular fish activity which includes schools of snappers, grunt, and spadefish.

SMALL HOPE BAY LODGE
Andros



Dick Birch

Conveniently situated at the edge of the world's second longest barrier reef, Small Hope Bay Lodge is the oldest and best known scuba resort in the Bahamas. It has provided more than 19 years of continuous service, catering to both experienced divers and novices interested in learning scuba. In the past, this resort has hosted dive groups and clubs from the U.S. and Canada.

The resort is nestled close to a picturesque lagoon and consists of a main lodge and 20 individual cabins. The main lodge serves as both a dining area and social meeting place complete with a shipwreck bar and living room atmosphere. Some of the unique attractions of this resort include waterbeds in three cabins and a giant hot tub for therapeutic soaking. Scuba facilities are located at the end of a long pier, directly adjacent to the dive boats.

Small Hope Bay Lodge is best known for its wall diving. Its vertical drop-off is regarded as one of the best in the world. The edge of the wall begins at approximately 70 feet and plummets straight down to an incredible depth of 6000 feet. Visibility frequently exceeds 150 feet and divers often see spectacular pelagic fish cruising here. There are also many excellent coral gardens and elkhorn formations in shallow water along the barrier reef. The wreck of an old Navy LCT landing craft provides an ideal feeding station for groupers and yellowtail.

The lodge is owned and operated by

Best of the Bahamas

ROMORA BAY
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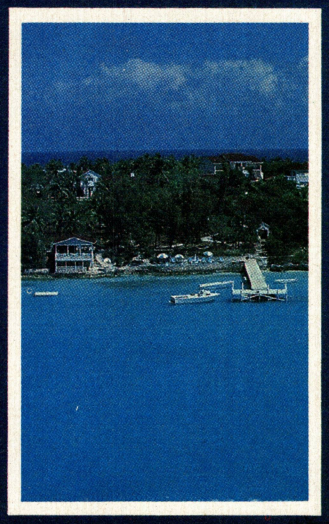
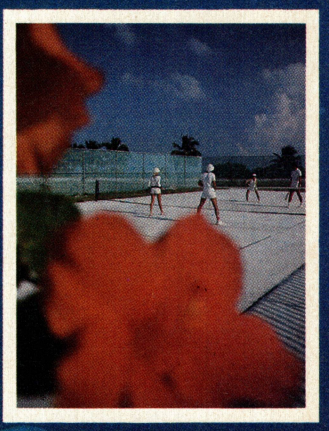
WALKER'S CAY
Abaco Islands





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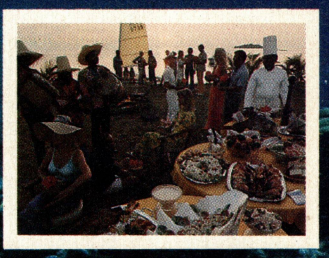

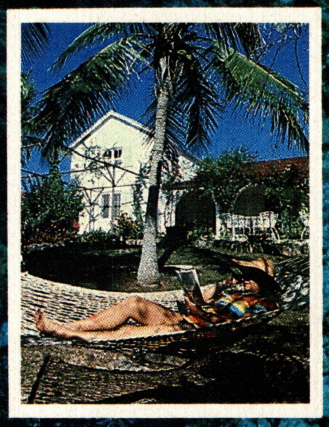

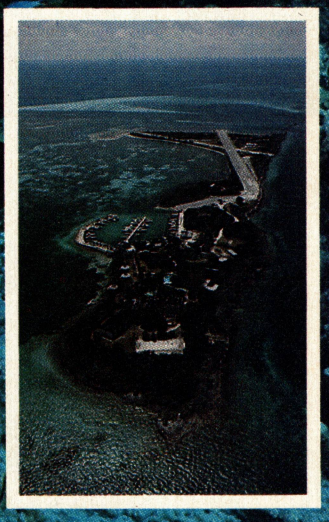

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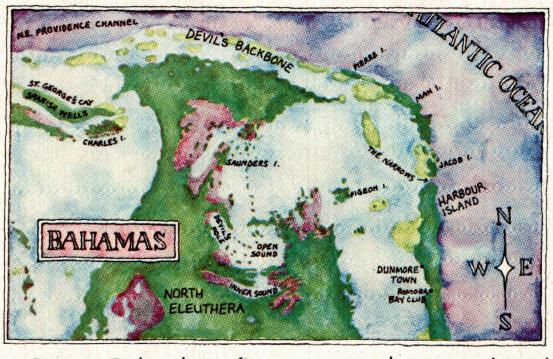
Devil's Backbone Reef hides the world's strangest shipwreck... and a case of Canadian Club.



Since Columbus first came ashore here, sailing men have been littering the Bahamas' blue waters with shipwrecks. Some carried treasure, some crowned heads. But the strangest of all carried a train.

Hell for ships, heaven for divers.

The train lies off Eleuthera's northern tip, scattered on Devil's Backbone Reef. At least six wrecks are strewn here: a diver's paradise, we thought, and a perfect place to hide a case of C.C.

We headed for Romora Bay Club on Harbour Island. The club could provide us a launch and guides to explore the reef. Nearby Dunmore Town could offer Bahamian entertainment, complete with Canadian Club. But no one could provide us with a reliable story of how or when the train had sunk on the reef.

A barracuda stands watch.

During our first dive, our guide pointed to a silver shadow above. Five feet long, half of that jaws, the menacing presence was a barracuda. Keeping a respectful distance, our search for a hiding place fanned out from the train wreck. We combed Devil's Backbone until we found a devilish hiding place for our watertight case of Canadian Club.

Seek groupers, and bring muscles.

To raise the C.C., you'll need scuba gear, guts and muscle: it weighs 200

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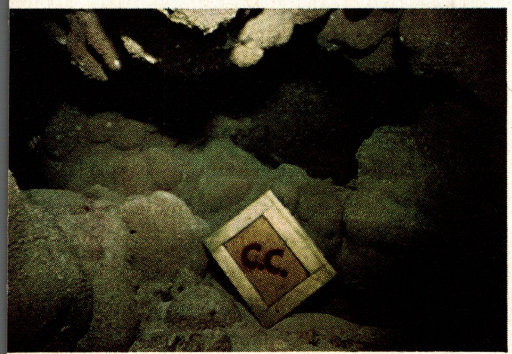

pounds. Start where a "dinner boat" went down on Devil's Backbone. Follow a channel across the reef to an old Ward Line steamer wreck (try this only in bright sunlight or you'll lose your boat). Take a bearing from its bow. Not more than 200 yards along, where the reef slopes into deep water and a big Nassau grouper lives, we sunk that heavily weighted, watertight case of Canadian Club. You can see exactly where it lies in the picture above.

May your seas for the search be as smooth as our whisky. Note: nonswimmers may discover their own Canadian Club adventure at bars or package stores by just saying "C.C., please."

Canadian Club

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ISLAND LOCATION	DIVE OPERATION	OWNER/ MANAGER	BAHAMAS PHONE	AIR COMPRESSOR	SCUBA TANKS	DIVE BOAT/ CAPACITY	DEPART. TIMES	TANK DIVES
1) ABACO (Hope Town)	Island Marine	Dave Gale	(809) 367-2666	Mako 4.3 cfm Mako 2.5 cfm Mako 2.5 cfm	50 steel	25 ft. Bertram/8 divers 20 ft. Bertram/5 divers 13 ft. Whalers (12)/4 divers	10:00 AM 10:00 AM 10:00 AM	1 tank dive trip 1 tank dive trip Snorkeling trip
2) ABACO (Marsh Harbour)	Chambered Nautilus	Dan Wiltfang	(809) 367-2800 (809) 367-2233	Mako 9.2 cfm Mako 3 cfm	30 steel	24 ft. Pro-Line/6 divers 13 ft. Avon/4 divers	10:00 AM 10:00 AM 2:00 PM	1 tank dive trip 2 tank dive trip 1 tank dive trip
3) ABACO (Walkers Cay)	Walkers Cay Dive Shop	Nick Rolle	None	Innerspace 14 cfm	78 alum.	34 ft. Custom/25 divers 20 ft. Mitchell/6 divers	10:00 AM 1:30 PM 8:00 PM	2 tank dive trip 1 tank dive trip 1 tank night dive
4) ANDROS (Andros Town)	Small Hope Bay Lodge	Dick Birch	(809) 328-2014 (809) 328-2015	Joy 15 cfm Joy 15 cfm	60 steel	34 ft. Flattop/24 divers 31 ft. Flattop/18 divers 28 ft. Flattop/18 divers	7:00 AM 9:30 AM 2:00 PM 9:00 PM	1 tank wall dive 2 tank dive trip 1 tank dive trip 1 tank night dive
5) BERRY ISLANDS (Chub Cay)	Chub Cay Dive Center	Don Lehman	(809) 325-1490	Worthington 15 cfm	80 steel	35 ft. Tri-hull/20 divers 26 ft. Flattop/12 divers 24 ft. Pro-Line/6 divers	9:00 AM 1:30 PM 9:00 PM	2 tank dive trip 1 tank dive trip 1 tank night dive
6) BERRY ISLANDS (Great Harbour Cay)	Great Harbour Diving Club	George Minns	None	Mako 4.5 cfm	10 steel	22 ft. Wellcraft/8 divers 22 ft. Wellcraft/8 divers	10:00 AM 1:00 PM	1 tank dive trip Snorkeling trip
7) BIMINI (North Bimini)	Bimini Undersea Adventures	Neal Watson Everett Jackson	(809) 347-2227	Ingersoll-Rand 15 cfm Mako 17 cfm	80 steel	34 ft. Dive Barge/24 divers 28 ft. T-Craft/20 divers 23 ft. T-Craft/10 divers	9:00 AM 1:00 PM 8:00 PM	2 tank dive trip 1 tank dive trip 1 tank night dive
8) CAT ISLAND (Cutlass Bay)	Cat Island Divers Ltd.	Jerry Schnabel Jeff Thompson	None	Mako 5.5 cfm Mako 3.5 cfm	60 mixed	27 ft. Utility/8 divers 24 ft. Seabird/6 divers 16 ft. Thunderbird/5 divers 16 ft. Whaler/4 divers	9:00 AM 1:30 PM 9:00 PM	2 tank dive trip 1 tank dive trip 1 tank night dive
9) CROOKED ISLAND	Pittstown Point Landings	Tom McKay	None	Mako 9.2 cfm	16 steel	Avon Inflatable/6 divers 18 ft. Lund Skiffs (5)/4 divers	10:00 AM 2:00 PM	1 tank dive trip 1 tank dive trip
10) ELEUTHERA (North Eleuthera)	Current Diving Club	John Schultz	(809) 333-2290	Innerspace 5 cfm Bauer 5 cfm	40 steel	47 ft. Sportfisher/20 divers 21 ft. Wellcraft/8 divers 23 ft. Ski Boat/6 divers	8:30 AM 9:00 AM 2:00 PM 7:30 PM	2 tank dive trip 1 tank dive trip 1 tank drift dive 1 tank night dive
11) ELEUTHERA (Harbour Island)	Romora Bay Club	Roy Schmidt	(809) 333-2325	Worthington 12 cfm	40 steel	25 ft. Delta/10 divers 25 ft. Delta/10 divers 28 ft. Flattop/10 divers	9:00 AM 2:00 PM 4:00 PM 9:00 PM	2 tank dive trip 1 tank dive trip 1 tank dive trip 1 tank night dive
12) ELEUTHERA (Harbour Island)	Valentine's Yacht Club	Jim Valentine	(809) 333-2142	Worthington 16 cfm Mako 12 cfm	50 steel	36 ft. Owens/10 divers 25 ft. Islander/7 divers 22 ft. Glastron/6 divers 19 ft. Whaler/5 divers	9:00 AM 9:00 AM 2:00 PM 8:30 PM	2 tank dive trip 1 tank dive trip 1 tank dive trip 1 tank night dive
13) ELEUTHERA (Spanish Wells)	Roberts Dive Shop	Dennis Roberts	Spanish Wells 297 or 371	Mako 4 cfm	30 steel	27 ft. Concord/12 divers 22 ft. Aquasport/8 divers 19 ft. Mako/6 divers 13 ft. Whalers (11)/4 divers	9:00 AM 2:00 PM	1 tank dive trip 1 tank dive trip
14) ELEUTHERA (Rock Sound)	Winding Bay Dive Center	Hubert Lewis	(809) 334-2019 (809) 334-2020	Mako 9.2 cfm	20 alum.	28 ft. Flattop/14 divers 18 ft. Utility/8 snorkelers	9:00 AM 10:00 AM 2:00 PM	1 tank dive trip Snorkeling trip 1 tank dive trip
15) ELEUTHERA (Cape Eleuthera)	Cape Eleuthera Dive Shop	Garfield McCartney	(809) 334-2252	Worthington 20 cfm	100 mixed	55 ft. Houseboat/30 divers 31 ft. Bertram/15 divers 23 ft. Mako/8 divers	9:00 AM 9:30 AM 1:30 PM 8:30 PM	3 tank dive trip 2 tank dive trip 1 tank dive trip 1 tank night dive
16) EXUMAS (George Town)	Exuma Divers Company	Wendle McGregor	(809) 336-2551 (809) 336-2552	Worthington 12 cfm Mako 5 cfm	36 mixed	38 ft. Houseboat/18 divers 23 ft. Formula/10 divers 18 ft. Utility/6 divers	9:30 AM 1:30 PM 8:00 PM	2 tank dive trip 1 tank dive trip 1 tank night dive
17) EXUMAS (Staniel Cay)	Staniel Cay Yacht Club	Joe Hocher	None	Mako 9.2 cfm Cornelius 4 cfm	25 steel	13 ft. Whalers (5)/4 divers 14 ft. Alum. Skiff/4 divers	None	Tank rentals, air fills, and boat rentals only
18) GRAND BAHAMA (Freeport)	Scubahamas Ltd.	Tom Kenwright	(809) 373-3040	Ingersoll-Rand 12.5 cfm	105 steel	42 ft. Bristol/20 divers 32 ft. Prowler/15 divers	9:00 AM 11:30 AM 2:00 PM 8:30 PM	1 tank dive trip 1 tank dive trip 1 tank dive trip 1 tank night dive
19) GRAND BAHAMA (Freeport)	U/W Explorers Society	John Englander	(809) 373-1244	Ingersoll-Rand 22 cfm Ingersoll-Rand 22 cfm	130 steel	42 ft. Thomas/24 divers 32 ft. Prowler/18 divers	8:30 AM 10:30 AM 1:30 PM 7:30 PM	1 tank dive trip 1 tank dive trip 1 tank dive trip 1 tank night dive
20) GRAND BAHAMA (West End)	Froome & Tostevin Skindiving	Nigel Froome Shelby Tostevin	(809) 327-3586 Ext. 7071	Ingersoll-Rand 12.5 cfm Ingersoll-Rand 12.5 cfm	15 steel	28 ft. Crestliner/4 divers	9:00 AM 9:00 AM 2:00 PM 2:00 PM	1 tank dive trip Snorkeling trip 1 tank dive trip Snorkeling trip
21) LONG ISLAND	Stella Maris Divers Ltd	Jorg Friese Peter Kuska Gerd Fuhrman	Overseas operator in Nassau or George Town	Bauer 14 cfm Mako 9.2 cfm Bauer 9.2 cfm Mako 4.5 cfm	95 mixed	65 ft. Custom/35 divers 57 ft. Wheeler/30 divers 42 ft. Colonial/20 divers 28 ft. Enterprise/8 divers	9:00 AM 2:00 PM 2:00 PM 9:00 PM	2 tank boat dive 2 tank boat/night dive 1 tank beach dive 1 tank night dive
22) NASSAU	Bahama Divers	Frank Watson	(809) 322-8431 (809) 323-4463	Worthington 16 cfm Worthington 16 cfm	50 mixed	60 ft. Carriecraft/30 divers 42 ft. Custom/30 divers	9:15 AM 2:00 PM	1 tank dive trip 1 tank dive trip Snorkeling trip
23) NASSAU	Nassau Dive Supply	Frances Young	(809) 322-4869	Mako 7.5 cfm Mako 4.5 cfm	25 mixed	18 ft. Flattop/10 divers 23 ft. Formula/8 divers	None	Open water training dives only
24) NASSAU	Underwater Tours Ltd.	Gardner Young	(809) 322-3285 (809) 322-4869 (809) 322-8173	Worthington 15 cfm Mako 4.5 cfm Cornelius 3 cfm Mako 2.5 cfm	100 steel	65 ft. Custom/50 divers 26 ft. Formula/6 divers 23 ft. Formula/6 divers	9:30 AM 9:30 AM	1 tank dive trip Snorkeling trip
25) SAN SALVADOR	Island Divers Ltd.	Dave Woodward	None	Ingersoll-Rand 15 cfm Ingersoll-Rand 15 cfm Ingersoll-Rand 15 cfm Mako 7.5 cfm	250 steel	34 ft. Flattop/18 divers 34 ft. Flattop/18 divers 34 ft. Flattop/18 divers 34 ft. Flattop/18 divers	9:30 AM 2:30 PM 9:00 PM	3 tank dive trip 2 tank dive trip 1 tank dive trip 1 tank night dive

TRIP PRICE	BEST DIVE SPOTS	TYPE OF DIVING	DIVEMASTERS/ DIVE GUIDES	SPECIAL DIVE PACKAGES	SUMMER RATE	WINTER RATE	MAILING ADDRESS	U.S. BOOKING OFFICE
$25.00 25.00 15.00	USS Adirondack The Towers Maxi Cave Bay Sandy Cay Reef	Civil War wreck Coral pinnacles U/W cave Underwater park	Dave Gale	None at this time			Island Marine Parrot Cay Hope Town, Abaco Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$25.00 35.00 25.00	Fowl Cay Reef Guana Cay Reef Kerr Rocks Devil's Hole	Coral gardens Shallow coral reef High coral heads Inland blue hole	Dan Wiltfang	7 day scuba tank rental plus air fills at $4 each	$14.00	Same Same	Chambered Nautilus P.O. Box 434 Marsh Harbour, Abaco Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$29.00 19.00 25.00	Nick's Caverns Mysterious Reef Wild Country Conch Flats	Coral caves Coral mounds Coral ravines Shallow heads	Nick Rolle Eddie Miller	7 days/7 nights — 14 dives room, 2 meals daily 3 days/2 nights — 4 dives room, 2 meals daily	$569.00 217.00	Same Same	Walkers Cay Hotel 700 S.W. 34th Street Ft. Lauderdale, Fla. 33315	Walkers Cay Hotel U.S. toll free (800) 327-1791 Florida (305) 523-5947
$14.00 16.00 14.00 18.00	The Wall Turnbull's Gut Barge Wreck Trumpet Reef	Wall dive Coral canyon Landing craft wreck Coral gardens	Dick Birch Brendal Steven George Fox Alec Blackwell	8 days/7 nights — 18 dives room, 3 meals daily 3 days/2 nights — 6 dives room, 3 meals daily	$496.00 130.00	Same Same	Small Hope Bay Lodge P.O. Box N-1131 Nassau, Bahamas	Holiday Wings U.S. toll free (800) 327-2514
$20.00 13.00 15.00	Lewis Ledge Mama Rhoda Rock Diamond Rock Chub Cay Reef	Wall dive Wreck dive Coral reef Coral reef	Don Lehman Alfred Wallace Joe Lewis	8 days/7 nights — 18 dives room, 2 meals 3 days/2 nights — 6 dives room, 2 meals	$513.00 246.00	$640.00 280.00	Chub Cay Club P.O. Box 661067 Miami Springs, Fla. 33316	Underwater Unlimited 216 Palermo Ave. Coral Gables, Fla. (305) 945-7837
$20.00 16.00	Petite Island Hawksnest Island The Drop-off Blue Hole	Coral gardens Coral reef Wall dive Inland blue hole	George Minns	None at this time			Great Harbour Cay Club 700 East Jeffrey Boca Raton, Fla.	Great Harbour Cay Club Toll free (800) 327-1042
$30.00 25.00 25.00	Continental Shelf Concrete Ship Moray Alley Hawksbill Reef	Drift dive Shallow wreck Coral canyons Coral reef	Neal Watson Everett Jackson	7 days/6 nights — 21 dives room, 3 meals daily, air transp. 2 days/1 night — 6 dives room, 3 meals daily, air transp.	$475.00 125.00	Same Same	Bimini Undersea Adventures P.O. Box 4960 Ft. Lauderdale, Fla. 33338	Bimini Undersea Adventures (305) 763-2188
$20.00 10.00 15.00	Amphitheater Port Howe Reef The Ledge Cutlass Bay Wall	Wall dive Coral reef Short drop-off Drop-off dive	Jerry Schnabel Vic Kieffer Rudy Rolle	8 days/7 nights — 16 dives room, all meals, air transp. 3 days/2 nights — 6 dives room, all meals, no air transp.	$510.00 130.00	Same Same	Cat Island Divers Ltd. P.O. Box 5122 Ft. Lauderdale, Fla. 33310	Cat Island Divers Ltd. (305) 467-7219
$20.00 20.00	The Wall Lighthouse Heads Barrier Reef Crooked Isld. Pass	Drop-off dive High coral heads Coral reef Coral reef	Tom McKay	8 days/7 nights — 7 dives room, all meals, tax, service chg. 4 days/3 nights — 3 dives room, all meals, tax, service chg.	$455.00 195.00	Same Same	Pittstown Point Landings c/o T & M Associates 1640 S.E. 7th Street Ft. Lauderdale, Fla. 33316	T & M Associates (305) 467-6850
$30.00 19.00 19.00 25.00	Current Cut Split Reef Indian Mound Black Shoals	Drift dive High Coral head Drop-off dive Shallow reef	John Schultz David Symonette	8 days/7 nights — 14 dives room, all meals 5 days/4 nights — 8 dives room, all meals	$365.00 219.00	Same Same	Current Club Resort c/o Martco Inc. 540 N. Golden Circle Drive Santa Ana, CA. 92705	Martco Inc. (714) 835-1205 Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$25.00 17.00 17.00 23.00	The Plateau Miller's Reef Cienfuegos Train Wreck	Deep reef Deep reef Steel wreck Civil War wreck	Bill Ellis Bobby Sanders	5 — single tank dive trips	$75.00	Same	Romora Bay Club P.O. Box 146 Harbour Island, Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$15.00 12.50 12.50 15.00	The Arch Carnarvon Hellson's Reef The Plateau	Deep coral reef Steel wreck Coral gardens Deep reef	Brent Stuart Tony Wells Jim Valentine	8 days/7 nights — 14 dives room, 2 meals daily 4 days/3 nights — 6 dives room, 2 meals daily	$390.00 178.00	$439.00 199.00	Valentine's Yacht Club P.O. Box 1 Harbour Island, Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$15.00 15.00	Pointer Reef Main Reef Devil's Backbone Train Wreck	Coral reef Caves & tunnels Wrecks Civil War wreck	Jock Morgan Dennis Roberts	5 days/4 nights — 8 dives room, 2 meals daily 6 — single tank dive trips	$208.00 75.00	Same Same	Roberts Beach Club P.O. Box 31 Spanish Wells, Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$15.00 8.00 15.00	Ocean Ledge Horseshoe Cave Finger Reef Beginner's Reef	Drop-off Caves & tunnels Shallow reef Snorkeling reef	Mark Schwartz Caleb Goodman	8 days/7 nights — 14 dives room, 2 meals daily 4 days/3 nights — 6 dives room, 2 meals daily	$490.00 210.00	$560.00 240.00	Winding Bay Beach Cottages P.O. Box 93 Rock Sound, Eleuthera Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$30.00 20.00 15.00 15.00	Sonar Cable Anchor Chain The Tunnel The Caves	Wall dive Wall dive Shallow reef Shallow reef	Garfield McCartney Livingston Culmer John McCartney Roscoe Knowles	8 days/7 nights — 12 dives room, 2 meals, air fare 3 days/2 nights — 4 dives room, 2 meals, air fare	$619.00 256.00	Same Same	Cape Eleuthera Resort The Dive Shop P.O. Box 528500 Miami, Fla. 33152	Cape Eleuthera Resort U.S. toll free (800) 327-8776 Fla. toll free (800) 432-8251 (305) 442-7200
$35.00 20.00 25.00	Stingray Reef Angelfish Blue Hole Mystery Cave Lobster Reef	Coral cut Ocean blue hole Ocean blue hole Shallow reef	Wendle McGregor Oral McGregor	4 days/3 nights — 6 dives room, 2 meals daily 8 — single tank dive trips	$177.00 120.00	$199.00 Same	Exuma Divers Company P.O. Box 152 George Town, Exumas Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$12.00 5.00	Thunderball Grotto Staniel Cay Wall Guana Cay Cut Conch Cut	Coral cavern Drop-off Drift dive Drift dive	Joe Hocher	Room, all meals, dive gear, air fills, and Boston Whaler, for two people	$105.00 per day	Same	Staniel Cay Yacht Club c/o T & M Associates 1640 S.E. 7th Street Ft. Lauderdale, Fla. 33316	T & M Associates (305) 467-6850
$19.00 19.00 19.00 25.00	Popa Doc Wreck Huey's Wreck The Caves Treasure Reef	Shallow wreck Wreck dive Coral caves Coral gardens	Tom Kenwright Keith Holthan Bill Tewes Dotti Flynn	Room, single tank dive, no meals	$25.00 per day	$35.00 per day	Scubahamas P.O. Box F-1261 Freeport, Grand Bahama	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$21.00 21.00 21.00 21.00	Littlehale's Lair Cup Handle Zoo Hole Ben's Cave	Coral reef Wall dive Ocean blue hole Inland blue hole	Jack Brackett Bruce Hyden Chris Albury Joan Caroll	8 days/7 nights — 21 dives condo apt., no meals 6 — single tank dive trips	$272.00 100.00	Same Same	U/W Explorers Society P.O. Box F-2433 Freeport, Grand Bahama	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$25.00 15.00 25.00 15.00	Eighty Foot Reef Sixty Foot Reef Thirty Foot Reef Sea Gardens	Coral caves Coral reef Coral patch reefs Snorkeling reef	Nigel Froome Shelby Tostevin	None at this time			Froome & Tostevin Skindiving Grand Bahama Hotel 158 Port Road, Dept. E Riviera Beach, Fla. 33404	Grand Bahama Hotel (305) 848-3478 Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
$30.00 35.00 20.00 35.00	Barracuda Heads Poseidon Point Grouper Village Shark Reef	High coral heads Beach dive Grouper feeding Shark dive	Joel Pratt Ednald McPhee Jason Burrows	8 days/7 nights — 18 dives room, all meals	$402.00	$447.00	Stella Maris Inn P.O. Box 105 Stella Maris Post Office Long Island, Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821 Robert Reid Associates Toll free (800) 223-6510
$25.00 25.00 15.00	Travelers Rest Mahoney Deep Green Cay Lyford Cay Drop-off	Coral reef Wreck dive Coral reef Wall dive	Mick Guy Jesse Pinder Leroy Lowe	8 days/7 nights — 5 dives room, no meals 5 — single tank dive trips	$240.00 95.00	Same Same	Bahama Divers Ltd. P.O. Box 5004 Nassau, Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800) 432-5594 Dade County (305) 443-3821
	Paradise Island Caves Rose Island	Coral caves Coral gardens	Frances Young Lambert Albury Colin Tozer	Scuba instruction and equipment sales only			Nassau Dive Supply P.O. Box N-1658 Nassau, Bahamas	
$25.00 15.00	Lyford Cay Drop-off Rose Island Lost Ocean Hole Mahoney Wreck	Wall dive Coral reefs Ocean blue hole Wreck dive	Gardner Young Lambert Albury Colin Tozer	5 — single tank dives	$88.00	Same	Underwater Tours Ltd. P.O. Box 5693 Nassau, Bahamas	Bahamas Resv. Service U.S. toll free (800) 327-0787 Fla. toll free (800)432-5594 Dade County (305) 443-3821
$38.00 22.00 16.00 15.00	Telephone Pole Snapshot Reef Frascate Wreck Sandy Point	Wall dive Coral gardens Steel wreck Coral caves	Chris McLaughlin Al Zamrok Dee Scarr Tom Stansell	8 days/7 nights — 18 dives room, all meals, air fare	$595.00	Same	Island Divers Ltd. Riding Rock Inn P.O. Box 1492 Ft. Lauderdale, Fla. 33305	Riding Rock Inn Toll free (800) 327-9473 Fla. (305) 566-7441

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International Oceanographic Foundation Photograph

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Where there's a barrier reef that's 12 feet deep on one side and 6,000 feet deep on the other.

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Where you can dive all day and then dance all night.

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BAHAMAS

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Underwater Tours (2)
Box ES-5693, Tel: (809) 322-3285

Nassau Dive Supply(2)
East Bay Street, (Pilot House)
Tel: (809) 322-4869

Nassau Underwater Explorers Ltd.(2,3)
Box N-7816, Tel: (809) 325-5910

GRAND BAHAMA

Underwater Explorers Society(1,2)
Box F-2433, Freeport, Tel: (809) 373-1244

Scubahamas(2)
Box F-2161, Lucaya, Tel: (809) 373-3040

Grand Bahama Hotel and Country Club(5)
158 Port Road, West Palm Beach, FL 33404
Tel: (305) 848-3478

ABACO

Abaco Diving Center(1,2,3,4)
c/o Conch Inn, Marsh Harbour, Box 434
Tel: 2800

David Gale's Scuba Diving School(1)
Parrot Cay, Hope Town

Walker's Cay Hotel & Marina(1)
700 S.W. 34th Street
Ft. Lauderdale, FL 33315, Tel: (800) 327-1791

ANDROS

Small Hope Bay Lodges(1)
Box N-1131, Tel: (809) 328-2014

EXUMA

Norman's Cay Club(1,2)
Norman's Cay, 1401 N.E. 10th St.
Pompano Beach, FL 33060
Tel: (305) 785-2430

Out Island Inn(2)
George Town, Vickers & Assoc.
6065 Roswell Rd. N.E., Atlanta, GA 30328
Tel: (404) 252-8357 or (809) 336-2171

Staniel Cay Yacht Club(1)
Staniel Cay, 1760 S.W. 67th Ave.
Plantation, FL 33317
Tel: (305) 584-3615 or (809) 334-2090

Hotel Peace & Plenty(2)
Box 55, George Town, Tel: (809) 336-2551

Minns' Water Sports,(2) George Town

HARBOUR ISLAND

Romora Bay Club(1,2)
Box 146, Tel: (809) 333-2325

ELEUTHERA

Cape Eleuthera Resort (2)
P.O. Box 528500, Miami, FL 33152
Tel: (305) 442-7200 or
Box 48, Rock Sound, Tel: (809) 334-2152

Current Yacht & Diving Club (1,2)
The Current, Tel: (809) 333-2290

Winding Bay Beach Cottage (1)
Box 93, Rock Sound, Tel: (809) 334-2020

BIMINI

Brown's Marina,(2) North Bimini

LONG ISLAND

Stella Maris Inn,(1,2) Box 105

Cape Santa Maria Club,(1,2) Box 105

SAN SALVADOR

Riding Rock Inn(1,2,3)
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Instructors certified by:
(1) NAUI,(2) PADI,(3) NASDS,(4) YMCA,(5) BSAC

BAHAMAS

Dick and Rosie Birch, well-known personalities in the international dive community. Dick has been diving for over 25 years and is a long-time NAUI certified instructor. Originally from Toronto, Dick is now a Bahamian citizen. Originally from the U.S., Rosie Birch is an extremely talented and industrious lady who has developed a unique company called Ambrosia, which specializes in hand-dyed fabrics. The factory now employs 23 Bahamians skilled in the art of batik.

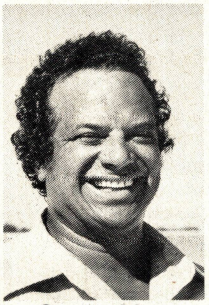
CHUB CAY DIVE CENTER
Berry Islands

Don Lehman

The Berry Islands have opened up to diving with the advent of a new and complete dive resort facility at the Chub Cay Club. This exclusive fishing resort is located at the southern tip of the Berry Islands group, close to the northern edge of the Tongue of the Ocean drop-off. Diving here is similar to the Andros Wall, but not as well-known. Most of the dive sites are conveniently located within 5 to 15 minutes of the Chub Cay marina. Underwater visibility is exceptionally good along the drop-off.

The newly opened dive center is managed by Don Lehman. Don is fully equipped with a large capacity compressor, 80 rental tanks, and three dive boats. Although the operation is too new for extensive comment, Don is well setup to handle medium sized groups of 12 to 20 divers, as well as small parties of hotel guests. He also provides air fills and tank rentals to certified divers aboard visiting yachts.

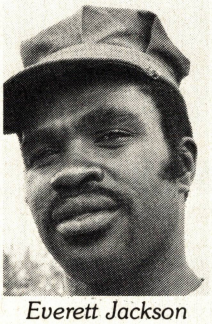
GREAT HARBOUR DIVING CLUB
Berry Islands


George Minns

A small scuba facility with limited services has been established at the recently reopened Great Harbour Cay Club at the northern end of the Berry Islands. This is a large and impressive resort hotel with 160 rooms, beach villas and golf course condominiums, capable of accommodating 350 guests. The dive operation is located at the beach and sailing club which is only a two-minute walk from the airstrip. The dive shop is situated on one of the finest beaches in the Bahamas, with over three miles of pure white sugar sand and sparkling water.

Still in the early development stages, this scuba facility consists of a small air compressor and ten rental tanks. Organized boat trips and escorted dives are not yet available. Air fills are five dollars per tank and rentals are available to experienced divers on request. Both the dive operation and sailing club are under the management of George Minns.

BIMINI UNDERSEA ADVENTURES
Bimini

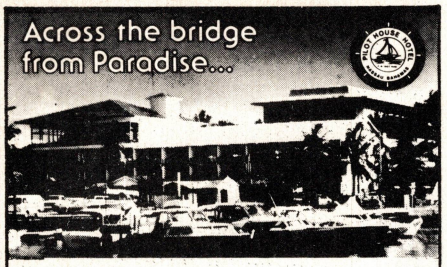

Everett Jackson

Conveniently located less than 50 miles east of the Florida mainland, Bimini offers quick and easy access for weekend trips or mini-dive vacations. Bimini Undersea Adventures is located on the pier at Brown's Hotel, North Bimini, and has been in operation for four years. This particular facility primarily caters to dive groups organized and guided by Florida dive shops or independent instructors. It can handle up to 40 divers and specializes in two to three day weekend junkets.

This dive operation is owned and operated by Neal Watson, a veteran diver of 20 years. He is a certified NAUI and PADI instructor and world-renown as a long distance underwater scuba swimmer. He presently holds the world's record for a 66 mile U/W swim from Islamorada to Miami.

Manager of the dive operation is Everett Jackson, a former commercial diver and graduate of the Commercial Diving Center. Born on San Salvador Island, Everett has worked as a commercial diver in the North Sea and has also served with the Bahamas Marine Patrol for six years. He has a Master Captain's license and is a PADI certified instructor.

Bimini offers a wide variety of dive experiences, including shallow coral gardens, coral caves and tunnels, medium depth reefs, and high coral head formations. The wreck of a concrete ship stands in 12 to 15 feet of water, providing for unusual snorkeling or underwater photography. Watson's most exciting trip is a drift dive along the edge of the continental shelf. The dive is made at an average depth of 90 feet while drifting along the face of a vertical drop-off. Bimini is also the site of a series of fascinating and highly controversial bottom formations once believed to be part of the sunken city of Atlantis.



...The **PILOT HOUSE HOTEL** (home of **BAHAMAS DIVERS**) is conveniently located on East Bay Street, 5 minutes walk from world famous Paradise Island Bridge, 10 minutes from the gambling casino. The marina across the street offers charter boats, deep-sea fishing gear and rental boats. **FREE glass bottom boat ride** downtown and back to our wharf, or if you wish, hop off at beautiful Paradise Island Beach, where towels, chaise lounges, shuffleboards, tennis, pool and calypso band await your enjoyment. Golf and horseback riding are also available.

BAHAMAS DIVERS, a water sports equipment store, gift shop, liquor store, beauty salon, barber shop, drug store and news stand are on our premises for your added convenience.

You'll enjoy our superb Bahamian, American and European cuisine along with locals and other tourists alike in our air-conditioned restaurant or outside in the cool unpolluted Bahamian air surrounded by lush, tropical gardens. **Dancing nightly** to the lilting tunes of our local musicians.

2 GREAT DIVE PACKAGES!

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Both packages include all hotel taxes & gratuities plus FREE transportation to and from dive boat. Special trips offered exclusively for experienced divers. FREE instruction for diving beginners.

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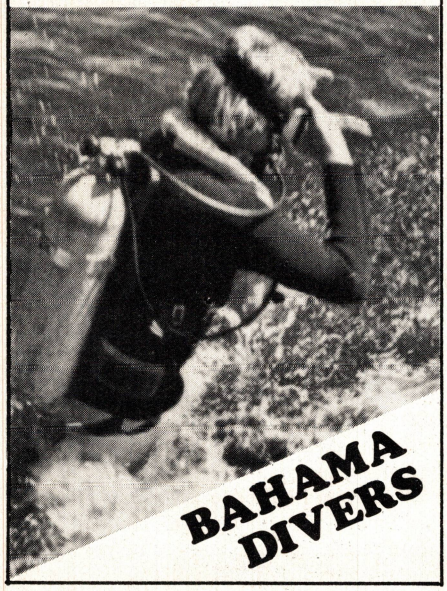
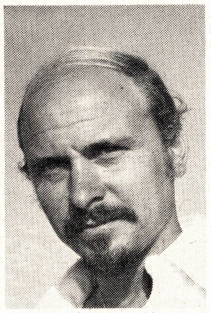


BAHAMAS

CAT ISLAND DIVERS
Cat Island

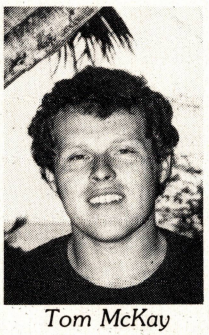

Jerry Schnabel

A small but complete dive resort facility can be found at the south end of Cat Island on the grounds of the Cutlass Bay Club. This is a rustic beach club with an informal atmosphere. Not yet commercially developed, Cat Island offers a unique view of Bahamian life similar to the way the islands were 50 years ago. The people are exceptionally friendly and the surroundings are quite rural.

The major attraction for Cat Island Divers is the superb wall diving available directly off both Cutlass Bay and nearby Hawksnest. These reefs are absolutely untouched and offer a virgin opportunity for diving and underwater photography. The top edge of the drop-off begins at 55 feet and drops vertically to over 1000 feet. Visibility frequently exceeds 150 feet and the fish life is spectacular. There are also many shallow water coral formations inshore.

Cat Island Divers was started by Jerry Schnabel and has been in operation for two years. Originally from the Washington, D.C. area, Jerry is a certified NAUI instructor, as well as an avid underwater photographer. The operation was recently expanded with the addition of Jeff Thompson as a managing partner. Formerly from St. Louis, Jeff is a certified PADI and SSI scuba instructor, as well as a marine biologist and dive shop owner.

PITTSTOWN POINT LANDINGS
Crooked Island

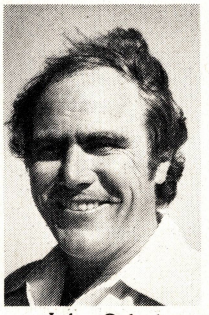

Tom McKay

The newest dive resort operation in the Bahamas is Pittstown Point Landings which opened in January, 1979 at the northern end of Crooked Island. It is the first time the reefs and waters of Crooked Island have been made accessible to vacationing divers. It is also the southernmost dive resort in the Bahamas, lying some 240 miles southeast of Nassau. This modest beach resort consists of private duplex bungalows, dining facilities, a lovely beach, and a private airstrip adjacent to the hotel grounds.

Scuba facilities presently consist of a medium size air compressor, 16 rental tanks, an Avon inflatable boat and five aluminum skiffs which can carry approximately four divers each. The resort is set up to handle small groups of six to ten divers or couples. Manager of the resort is Tom McKay, a certified scuba instructor from the U.S.

Because this resort is so new, it is difficult to provide a complete picture of the diving quality or undersea attractions. Needless to say, the reefs are virgin and totally untouched by either commercial fishermen or previous divers. Underwater visibility in this area is considered extraordinary. Dive attractions include coral sea gardens, a barrier reef, high coral heads and several good drop-offs.

CURRENT DIVING CLUB
Eleuthera


John Schultz

Located on the channel side of North Eleuthera is a cozy little 19 room resort hotel which caters to both individual divers and visiting dive groups. The atmosphere is informal, with personalized service and excellent food. The hotel's specialty is home baked bread from the neighboring village of Current. The hotel consists of a dining room, separate cocktail lounge, and private duplex cottages. Directly in front of the dining room is a pier for the dive boats and visiting yachts.

The hotel's scuba facilities include two air compressors, three dive boats and 40 rental tanks. Both the hotel and dive operation are managed by John Schultz, a veteran diver with more than 12 years experience. Formerly the manager of a dive shop in Phoenix, Arizona, John is a certified NAUI, PADI, and NASDS instructor. He came to the Current Club in 1975 as resident divemaster and has since become the general manager. This particular resort caters to dive groups mostly from the eastern part of the U.S. as well as California and Canada.

The Current Club offers a unique variety of dive experiences including a series of high coral heads, a drop-off, a steel hull freighter half out of the water, and numerous coral caves and tunnels. By far the most exciting experience at the Current Club is a high speed drift dive through Current Cut. Dive guests sail through this natural channel at speeds of four to seven knots while viewing a fantastic array of fish life, including schooling horse-eye jacks, formations of eaglerays, large groupers and big barracudas.

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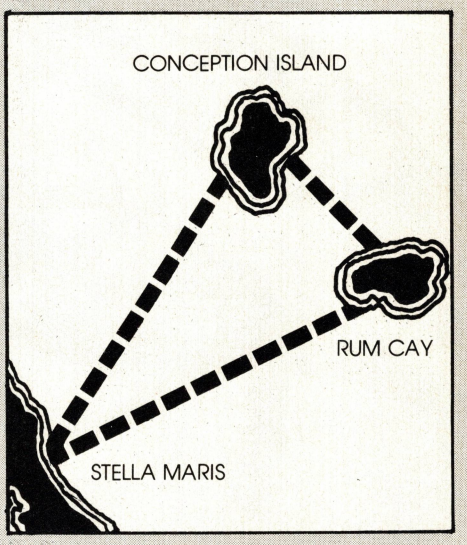

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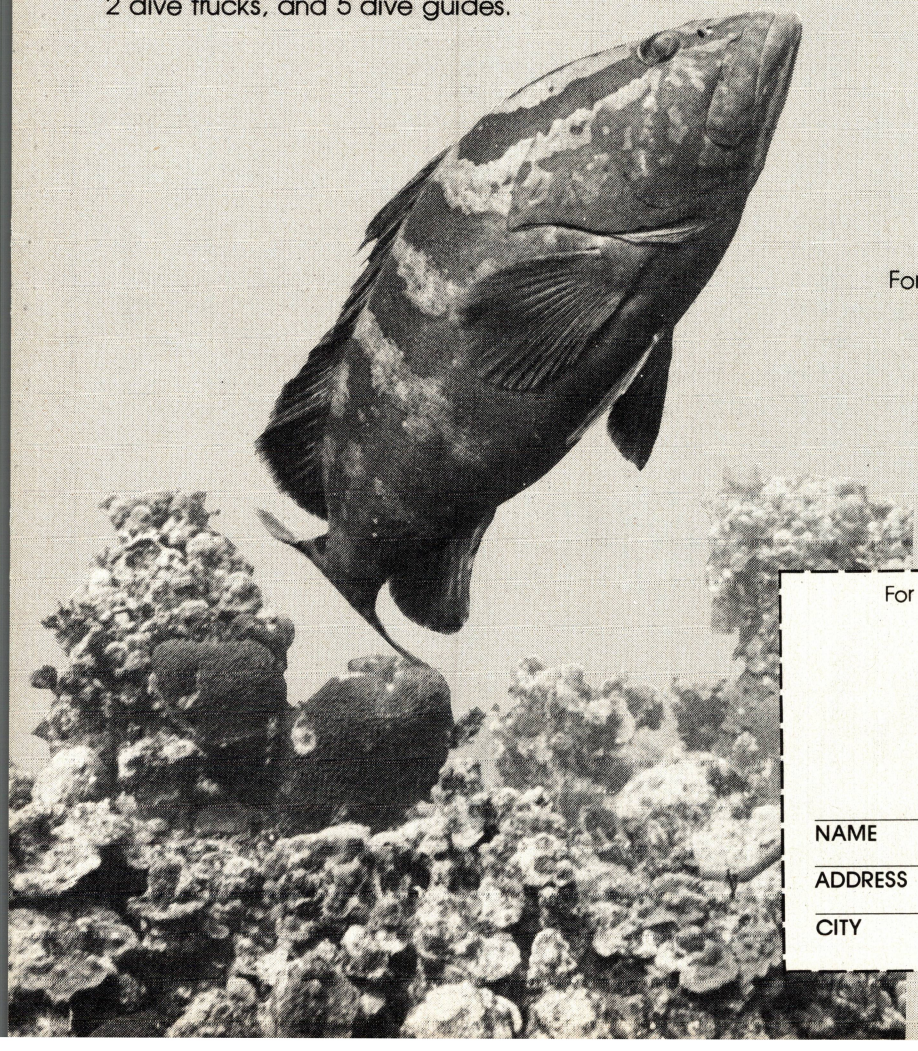

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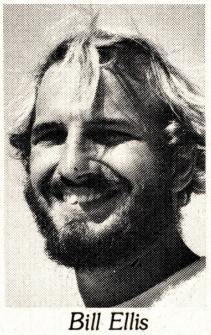
BAHAMAS

ROMORA BAY CLUB
Eleuthera



Bill Ellis

Situated on beautiful Harbour Island, off the Atlantic side of North Eleuthera, is a delightful hillside hotel known as the Romora Bay Club. This resort has a total of 27 rooms including several private cottages, and can accommodate up to 60 guests. The hotel is owned and operated by Roy Schmidt, a veteran diver of many years and a certified NAUI instructor. While the hotel does not cater exclusively to divers, Roy has made considerable effort to develop a program which would be attractive to both experienced scuba enthusiasts and beginners. The Romora Bay Club hosts a great many dive groups which are organized by Omorka Ltd. of Atlanta. The groups range in size from 10 to 25 divers.

The scuba shack is located at the foot of the boat pier and is equipped with an inventory of 40 rental tanks and a heavy duty air compressor. There are three dive boats capable of carrying 10 divers each. The entire dive operation is managed by Bill Ellis, a certified YMCA instructor from Atlanta.

Dive attractions in the Harbour Island area include a variety of shipwrecks which lie along a barrier reef called Devil's Backbone. Depths here range from 20 to 35 feet and include many beautiful elkhorn formations. South of Harbour Island are several fantastic coral plateaus with depths ranging from 40 to 120 feet. Reserved for experienced divers, these sites offer a marvelous array of colorful sponges, interesting coral formations, and plenty of fish action. Underwater visibility often exceeds 100 feet on these deeper reefs.

VALENTINE'S YACHT CLUB
Eleuthera

Jim Valentine

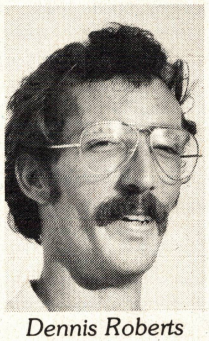
Also situated on Harbour Island is a well run combination yacht club and hotel which has recently branched out into scuba. Primarily catering to deepsea fishermen and yachtsmen, Valentine's has recently installed complete scuba facilities for both individuals and groups. The resort has a total of 27

rooms and can handle dive groups of up to 30 people.

The scuba facilities are located in a building at the foot of Valentine's pier and include two air compressors and an inventory of 50 rental tanks. There are a total of four dive boats, ranging in size from a 36 foot Owens to a 19 foot Whaler. The dive operation is under the management of Jim Valentine, son of the hotel owner. Jim is an avid dive enthusiast and is presently a NAUI assistant instructor. Also working with Jim are two divemasters who guide trips on a daily basis.

Dive trips are conducted basically to the same reefs as those used by Ramora Bay Club, but the specific sites are different. The itinerary of dive experiences includes shipwreck exploration, shallow coral gardens, medium depth reefs, caves and tunnels, and deep coral plateaus.

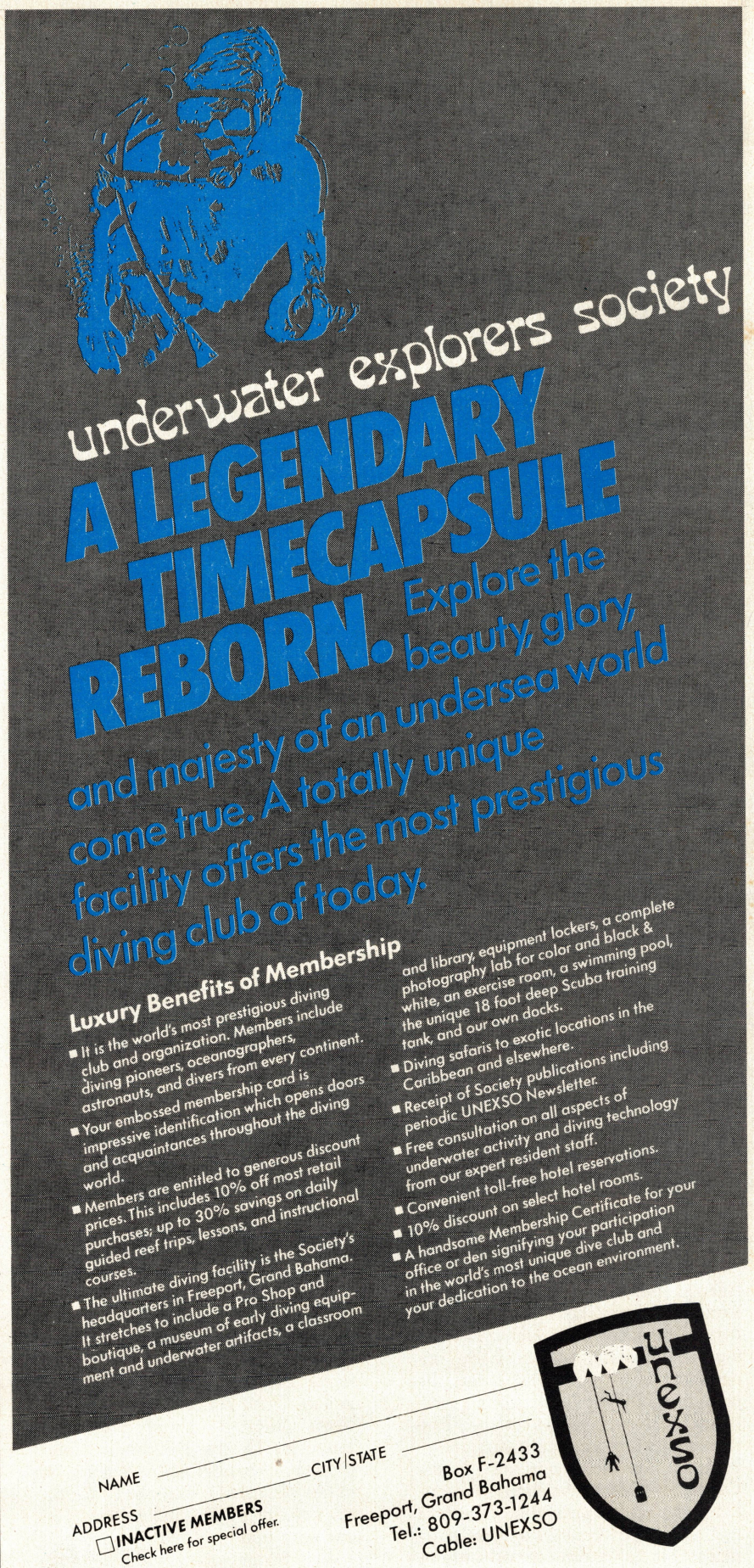
ROBERTS DIVE SHOP
Eleuthera

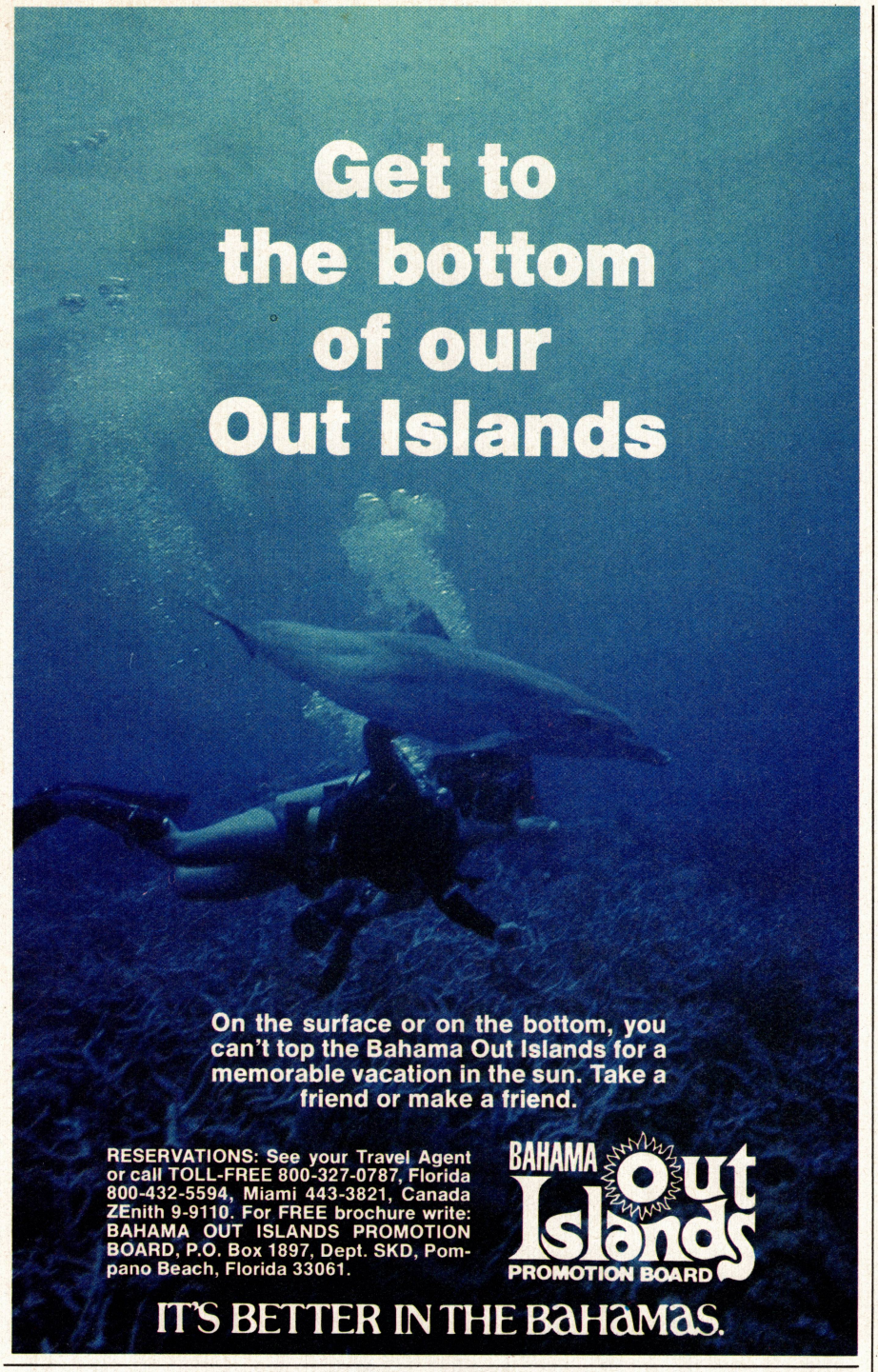


Dennis Roberts

A mile off the northwest tip of North Eleuthera lies the island community of Spanish Wells, home of some of the best fishermen and seafarers in the Bahamas. You will find Roberts Dive Shop on the waterfront, toward the west end of town. This facility was established specifically for guests staying at both Roberts Beach Club (ocean side of island) and the Roberts Harbour Club (harbour side of island). It is a small shop at the moment, but plans are being made for expansion in the future. There are three dive boats and 11 small Boston Whalers with outboards available on a rental basis. Roberts Beach Resort has 21 rooms and 6 cottages right on the beach, and Roberts Harbour Club has 14 rooms and 5 apartments. The dive shop is managed by Dennis Roberts, an avid dive enthusiast who became YMCA certified in Miami. Divemaster for the operation is Jock Morgan, one of the best commercial spearfishermen in Spanish Wells.

The dive sites around Spanish Wells are mostly shallow to medium depth coral reefs and include large formations of elkhorn. Some of the reefs offer an excellent opportunity for exploration of small caves and winding tunnels. There are also a great many shipwrecks which are fun to explore and photograph.





CANADIAN CLUB TREASURE HUNT

Divers, drawn to the depths of the Atlantic by the mysterious lure of sunken treasure, have long been intrigued by what the water surrounding the Bahamas might hold. But underwater adventurers exploring the area around Devil's Backbone Reef should not be surprised if they find treasure of a more recent vintage.

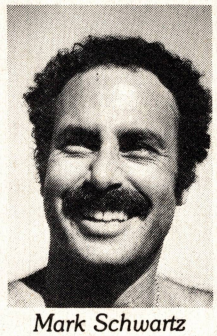
Hiram Walker Incorporated, the Canadian distiller, has chosen an area along the reef to submerge a case of its Canadian Club whiskey. This is the newest in a series of adventures created for Canadian Club's famous hide-a-case ad campaign.

Divers planning expeditions off Devil's Backbone Reef, located off the northeast coast of Eleuthera, are now being provided with clues in national magazines as to the whereabouts of the watertight case of Canadian Club. Among the clues are: "Start where a 'dinner boat' went down on Devil's Backbone," and, "Follow a channel across the reef to an old Ward Liner steamer wreck (try this only in bright sunlight or you'll lose your boat)."

What better place than the Bahamas to provide another exciting Canadian Club adventure?

BAHAMAS

WINDING BAY DIVE CENTER
Eleuthera



Mark Schwartz

There is a small resort scuba facility located at the Winding Bay Beach Cottages, an elegant beach resort seven and one-half miles north of Rock Sound. The hotel has 36 beautifully furnished rooms, all facing toward the open Atlantic with a beautiful sand beach directly in front. The dive center is just one of the many watersports activities offered at this hotel and its services are primarily for the hotel guests. There is a small compressor, 10 rental tanks and a Flattop boat. The dive operation is managed by Mark Schwartz, a PADI instructor who came to Rock Sound in November 1978. Originally from Los Angeles, Mark has been diving for eight years and previously worked at a dive resort in Belize.

Dive sites in the Winding Bay area include sea gardens, shallow coral reefs, a few small caves and tunnels, and a sloping drop-off. This resort is ideal for a person who is seeking an all-around beach vacation with a little diving mixed in.

CAPE ELEUTHERA DIVE SHOP
Eleuthera

Captain Mac

Located in the southern portion of Eleuthera, facing Exuma Sound, is the sprawling resort complex of Cape Eleuthera. This is a huge country club style resort complete with 40 villas, a huge marina, an 18 hole golf course, and six tennis courts. Guests rent electric golf carts for motoring around this resort or hail down a passing hotel tram. It is a perfect resort for a family vacation as the selection of recreational activities provides something for everyone.

The dive shop is located right at the marina next to the harbormaster's office. It consists of a large air compressor, 100 scuba tanks and four dive boats. The shop has perhaps the most unique dive boat in the Bahamas: a 55 foot steel hull catamaran style houseboat which can accommodate up to 30 divers. The houseboat offers the utmost in comfort including a galley, living room, stereo, and an electric organ. This particular dive resort frequently caters

BAHAMIAN FISHERIES LAWS THAT AFFECT DIVING

1. No marine product (conch, crawfish, scalefish, coral, etc.) may be taken with the use of underwater breathing apparatus (scuba, surface compressor, etc.).

2. A snorkel diver may only use an Hawaiian sling or pole spear. Any other powered speargun may not be used.

3. The export of any marine product is illegal unless a permit is issued (this prevents American boats from spearfishing or taking coral, then returning to the States with marine products).

4. Protected areas. No marine product may be taken from the north coast of New Providence from Goulding Cay in the west to a line drawn between the eastern tip of Atholl Island and the eastern end of New Providence, and inside of a line drawn through the fringing islands.

No commercial fishing is allowed in the Exuma Cays Land and Sea Park. A daily quota of fish may be taken by each boat (see Bahamas National Trust By-Laws).

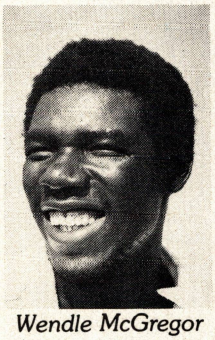
5. No toxic product may be used to kill or catch fish.

to large groups, accommodating up to 50 divers at one time.

Owner of this dive operation is Garfield McCartney, one of the friendliest and most gregarious divemasters in the Bahamas. Nicknamed Captain Mac, Garfield is a certified PADI open water instructor and a veteran diver of more than 20 years. Working under him are four more dive guides who are well acquainted with the reefs and waters of Cape Eleuthera. The majority of their business is half-day dive trips to nearby sites every morning and afternoon. Night dives are conducted at least once a week.

Cape Eleuthera's major dive attraction is a spectacular wall, not more than 15 minutes from the marina, starting in 60 feet of water. This magnificent drop-off plummets to depths of 1200 feet. The wall has some outstanding formations of tube sponges, black coral trees and other exotic marine life. Inshore are a number of excellent shallow water coral reefs with a marvelous array of small marine life and macro photography subjects.

EXUMA DIVERS COMPANY
Exumas



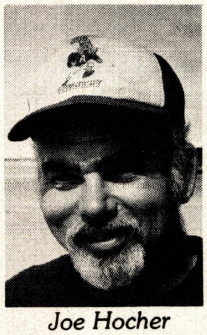
Wendle McGregor

There is a small but growing dive operation located at Minn's Marina at George Town, directly across the street from the Peace and Plenty Hotel. Although this operation has been in business for barely a year, it has already built up to two air compressors, 36 rental tanks and three dive boats. It is an independent operation which serves both the Peace and Plenty Hotel and the Out Island Inn, as well as passing yachtsmen who are seeking tank rentals, air fills, or instruction.

The Exuma Diving Co. is owned and operated by Wendle McGregor, a professional dive guide with eight years experience. Originally from Andros, Wendle has been diving for 15 years and worked at two other dive resorts before starting his own. He is a certified PADI instructor.

The dive attractions around George Town consist of a unique blend of coral reefs and several fascinating ocean blue holes. The latter are filled with a variety of marine life including angelfish, reef fish, and lobsters. The coral reefs lie in depths from 30 to 45 feet, mostly in the channel between the two islands. Wendle's dive trips are very personalized, with three to six divers per trip, but he has also hosted larger groups.

STANIEL CAY YACHT CLUB
Exumas



Joe Hocher

There is a delightful little yacht club/hotel located on Staniel Cay, half-way down the Exuma island chain. This mini-resort consists of six cottages, a restaurant, bar, and marina dock. The resort primarily caters to passing yachtsmen, private pilots and a few experienced divers. There is a newly paved airstrip on the island, and the resort offers a variety of rental equipment for various watersports, including wind-surfing, sailing and fishing.

The entire resort is operated by Joe Hocher, a veteran diver with 24 years experience. He has a small compressor, 25 rental tanks, and six rental boats. Because this resort is almost a one-man operation,

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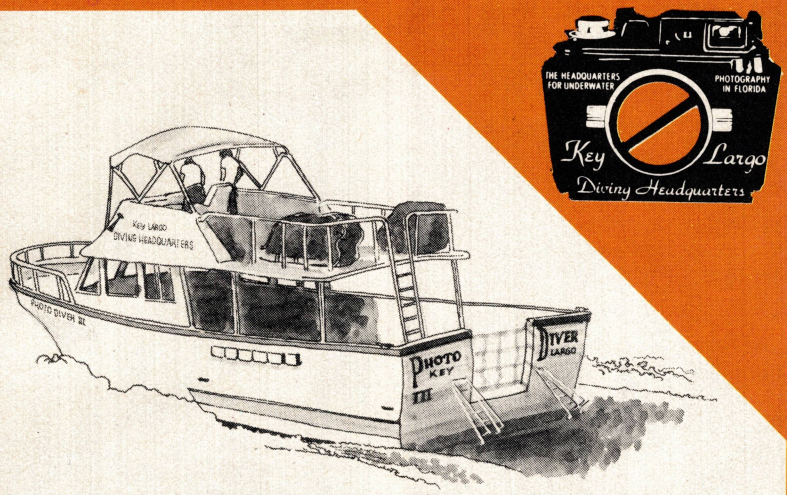

BAHAMAS

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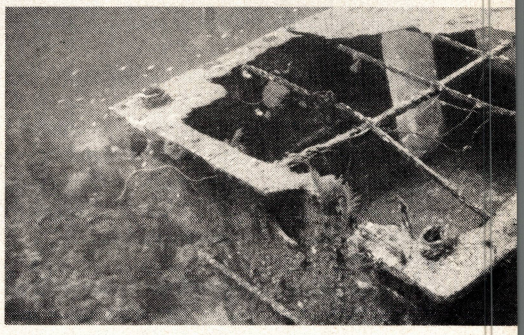
BAHAMAS

dive services are limited to air fills, tank rentals, and boat rentals. There are no organized dive trips or scuba instruction. Guests staying at this resort are provided with their own small boat, dive gear and instructions for finding the dive sites.

The major dive attraction at Staniel Cay is a huge underwater cavern known as Thunderball Grotto. This giant cave is the size of a basketball court and has seven different entrances. The upper portion of the cave is above the surface. Depths range from 5 to 25 feet. There is also excellent diving in some of the passes or cuts between various Exuma Islands, as well as a good drop-off located directly in front of the Staniel Cay club.



SCUBAHAMAS
Grand Bahama

Keith Holthan

There is a full service dive shop operation in Freeport located on the ground floor of the Victoria Inn. This operation caters primarily to dive clubs, scuba instructors and dive stores who arrange group tours to this hotel. It is circular, with a fresh water swimming pool in the center and a restaurant, cocktail lounge and dive shop along the sides. There are 40 rooms and the hotel specializes in a full hotel/dive package of services.

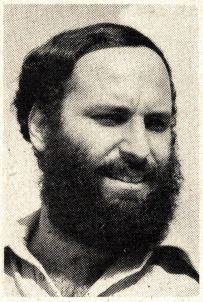
Owner and operator of Scubahamas is Tom Kenwright, a PADI open water instructor. Originally from England, Tom started diving 15 years ago in Australia and came to Freeport in 1969. Divemaster for the operation is Keith Holthan, a veteran diver with 22 years experience. Also from England, Keith became a BSAC instructor in 1961 and a PADI instructor in 1977.

This operation has a large air compressor, 105 rental tanks, and two large dive boats. The shop carries a good selection of equipment and scuba accessories.

Underwater attractions in the Freeport area span a wide variety of dive experiences. Scubahamas conducts half-day

trips to nearby sea gardens, shallow coral reefs, two different shipwrecks, coral caves and canyons, and the drop-off.

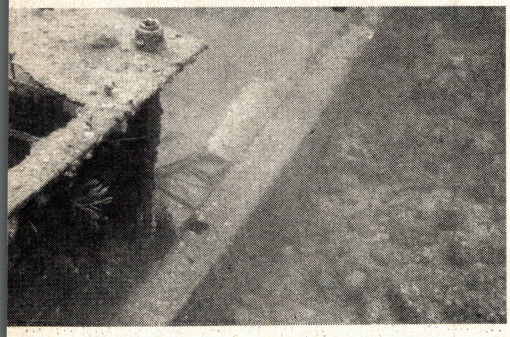
UNDERWATER EXPLORERS SOCIETY
Grand Bahama



John Englander

Jack Brackett

Freeport is the home of one of the largest and most diverse independent dive resort operations to be found anywhere in the Bahamas. Started in 1965 by Al Tilman, the Underwater Explorers Society now serves close to 4000 divers annually, 2500 of which are novices who enroll in resort instruction programs. Emphasis is on education oriented dive programs both at the beginner and advanced diver levels. This operation caters to a wide spectrum of visitors including individuals, couples, small groups, families, large groups, and professional seminars and workshops. Every June, UNEXSO hosts a NAUI Instructor Training Course, and there are medical diving seminars conducted in April, August, and November.



Pioneers in the development of dive resort design, UNEXSO is one of the most modern dive center facilities in the world today. It has an 18 foot deep training tank which holds 70,000 gallons of fresh water and is equipped with seven observation windows. This tank is specifically used for training and testing ear equalization. There is a four-man recompression chamber utilized for medical and instructor training. There is an air-conditioned classroom, equipped with audio-visual facilities, which can hold 25 students. A new darkroom facility has just been completed for E-6 color film processing, as well as black and white film processing and printing. This facility will be utilized for future classes in underwater photography. A newly decorated divers' lounge provides a social activities center and auditorium for underwater film

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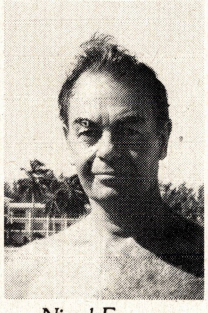
shows. There is also an exercise room, sauna, divers' library, and museum filled with scuba memorabilia. The air compressor facility is equipped with two giant 22 cfm Ingersoll-Rand compressors with computerized electronics for monitoring air purity and pressure ranges.

UNEXSO is owned and operated by John Englander, a NAUI instructor of 10 years. John first came to Freeport in 1972 and took over the management in 1974. Diving supervisor is Jack Brackett, a highly experienced NAUI instructor who has worked at several other dive resorts in the Bahamas. The staff consists of nine NAUI certified instructors who teach the various dive programs and conduct trips to the nearby reefs.

UNEXSO offers a complete range of dive experiences including shallow water coral reefs, sea gardens, medium depth reefs, coral canyons and coral caves. There are several excellent wall dives along the drop-off which are reserved for experienced divers or students enrolled in UNEXSO's wall diving course. There is also an ocean blue hole, filled with marine life, and several inland blue holes, complete with stalactites.

FROOME & TOSTEVIN SKINDIVING
Grand Bahama


Nigel Froome

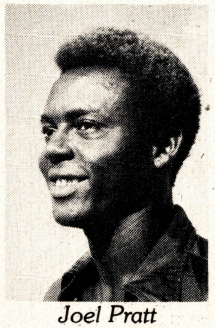
Shelby Tostevin

There is a small scuba facility at West End, Grand Bahama. It is on the grounds of the Grand Bahama Hotel, a giant 580 room convention style hotel facility which specializes in convention groups and offers a wide range of resort activities.

The dive operation primarily caters to hotel guests and specializes in snorkeling tours. It maintains an inventory of 60 sets of snorkeling gear which are rented out on a daily basis. The shop also has two air compressors but only a small inventory of 15 rental tanks. Scuba trips and instruction are conducted on a daily basis but the trips are restricted to small groups of three to four divers. Divers seeking more diving are frequently referred to UNEXSO at Freeport.

This dive facility has been in operation for almost 20 years. It is owned and operated by Nigel Froome and Shelby Tostevin, both originally from Guernsey Island, England, and both experienced divers of 30 years. Shelby is a certified BSAC scuba instructor. The dive sites in the West End area are basically shallow to medium depth coral reefs which are good for snorkeling and beginner scuba. The best dive is an 80 foot reef which has an excellent assortment of marine life.

STELLA MARIS DIVERS
Long Island


Joel Pratt

Located in the southern part of the Bahamas, Stella Maris is considered one of the major dive operations for experienced divers. It is a full service resort complex which can accommodate up to 160 people. The operation caters to individual divers, passing yachtsmen and private pilots. The resort has an international reputation and caters to dive groups from the U.S., Canada, Germany, Switzerland, Belgium, Austria, and England. Stella Maris has been in operation since 1965 and is managed by three Ger-

mans: Jorg Friese, Peter Kuska, and Gerd Fuhrman.

The scuba facilities are located at the Stella Maris marina, approximately one mile from the hotel. They include a dive shop, classroom for scuba instruction and deep training tank. The resort has four air compressors, 95 rental tanks, three dive boats and two dive trucks. The trucks are used primarily for beach dives and occasionally for blue hole dives. The larger truck can carry up to 30 divers. A new 65 foot custom dive boat is presently under construction and will be able to carry 35 divers for day trips and 16 divers for overnight excursions to nearby Conception Island and Rum Cay. The head divemaster is Joel Pratt, a certified PADI open water instructor. He is assisted by Ednal McPhee and Jason Burrows, also both PADI certified divemasters.

Stella Maris offers a wide variety of dive experiences, including shallow coral reefs, high profile coral heads, medium depth reefs, and sea gardens. There are several excellent fish-feeding stations and one specific reef which provides close observation of shark activity. There is also excellent wreck diving available at both Conception Island and Rum Cay.

See the map at left for the location of the 25 dive operators of the Bahamas. The facilities offer numerous services and all types of diving.

BAHAMA DIVERS, LTD.

New Providence

Frank Watson

Located in the shopping arcade of the Pilot House Hotel, Bahama Divers is a combination full service dive shop and independent dive tour operator. This company was originally started by Bill Whiteland six years ago and came under the management of Frank Watson in December, 1977. The company's primary business is snorkeling tours, introductory scuba lessons and shallow water reef trips for tourists staying at many of Nassau's major hotels. It has service contracts with at least eight major hotels and handles thousands of tourists each year.

Bahama Divers has two large volume air compressors, 50 rental tanks and two large dive boats capable of carrying 30 divers each. In addition to its tourist dive business, Bahama Divers also caters to experienced divers. It offers advanced scuba trips on Monday, Wednesday and Saturday mornings. These excursions are to the more exciting dive spots including a local shipwreck and an exceptionally good drop-off.

NASSAU DIVE SUPPLY

New Providence

Frances Young

Conveniently located on East Bay Street, next door to the Pilot House Hotel, is a unique combination full service dive shop and yacht brokerage. Owned and operated by Frances Young, this operation specializes in scuba instruction and scuba equipment sales. A fresh water training pool and classroom are located directly behind the dive shop and two dive boats are berthed across the street. Frances is a certified PADI master instructor, and the shop offers a variety of training programs from resort course through basic certification and up to assistant instructor. The shop is a certified PADI training facility and authorized dealership for both Dacor and U.S. Divers equipment. The shop also carries a fine assortment of scuba accessories, swimwear, inflatable boats, and outboard motors.

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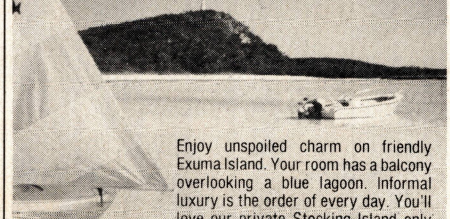

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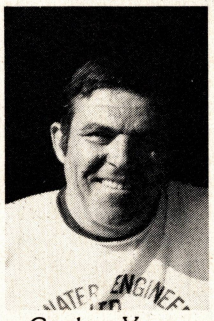
UNDERWATER TOURS, LTD.
New Providence



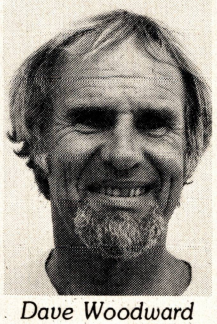
Gardner Young

Nassau is one of the homes of one of the oldest and best known dive services in the Bahamas. Started in 1960 by Gardner Young and Charlie Badeau, this dive tour business has developed a world-wide reputation. There are four air compressors, 100 rental tanks and four dive boats. The largest of these boats is a 65 foot converted ferryboat which can carry up to 50 divers and snorkelers on the regularly scheduled half-day trips.

Gardner is a well-known personality in the dive community, having worked on many major movie productions such as, *Thunderball, Sea Hunt,* and *Around the World Under the Sea.* In addition to his dive tour business, Gardner operates a successful commercial diving company which performs most of the underwater construction and inspection in the Bahamas.

Primarily catering to hotel guests from many of Nassau's bigger hotels, Underwater Tours offers regularly scheduled half-day trips to nine miles of coral reefs off Rose Island. Advanced scuba trips can be made by special arrangement and Gardner can provide a fast boat to some of the more exciting dive locations, such as Lyford Cay Drop-off, the Lost Ocean Hole, and the Mahoney Wreck.

ISLAND DIVERS, LTD.
San Salvador Island



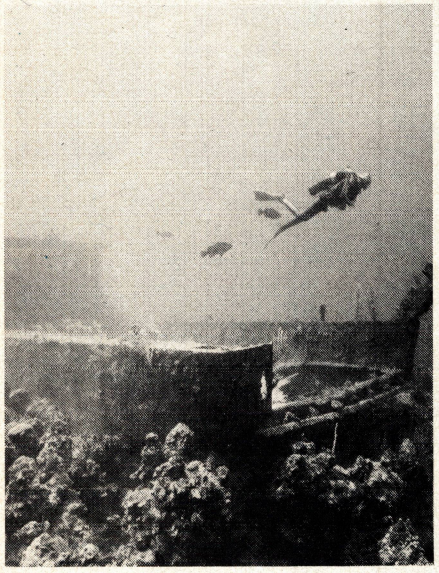
Dave Woodward

One of the fastest growing dive operations in recent years is located on the small island of San Salvador in the southeast Bahamas. This operation is a combination land development company (Columbus Landings), resort hotel (Riding Rock Inn) and dive shop (Island Divers). It caters primarily to hard core dive enthusiasts, offering a one week scuba package with three tank dives daily. The hotel can accommodate approximately 60 people and is generally full, with two and sometimes three separate vacationing dive groups.

The dive shop is located at the marina and maintains a staggering inventory of

four air compressors, 250 rental tanks and four dive boats. The operation is managed by Dave Woodward and staffed by five certified instructors, all PADI, NASDS, SSI, NAUI, YMCA. Adjacent to the dive shop is an air-conditioned scuba workshop which is used for underwater photography classes and medical diving seminars. There is also a darkroom facility for E-6 color film processing and an underwater camera rental department. Photography instruction includes four advanced photo courses a year and beginner classes on a weekly basis.

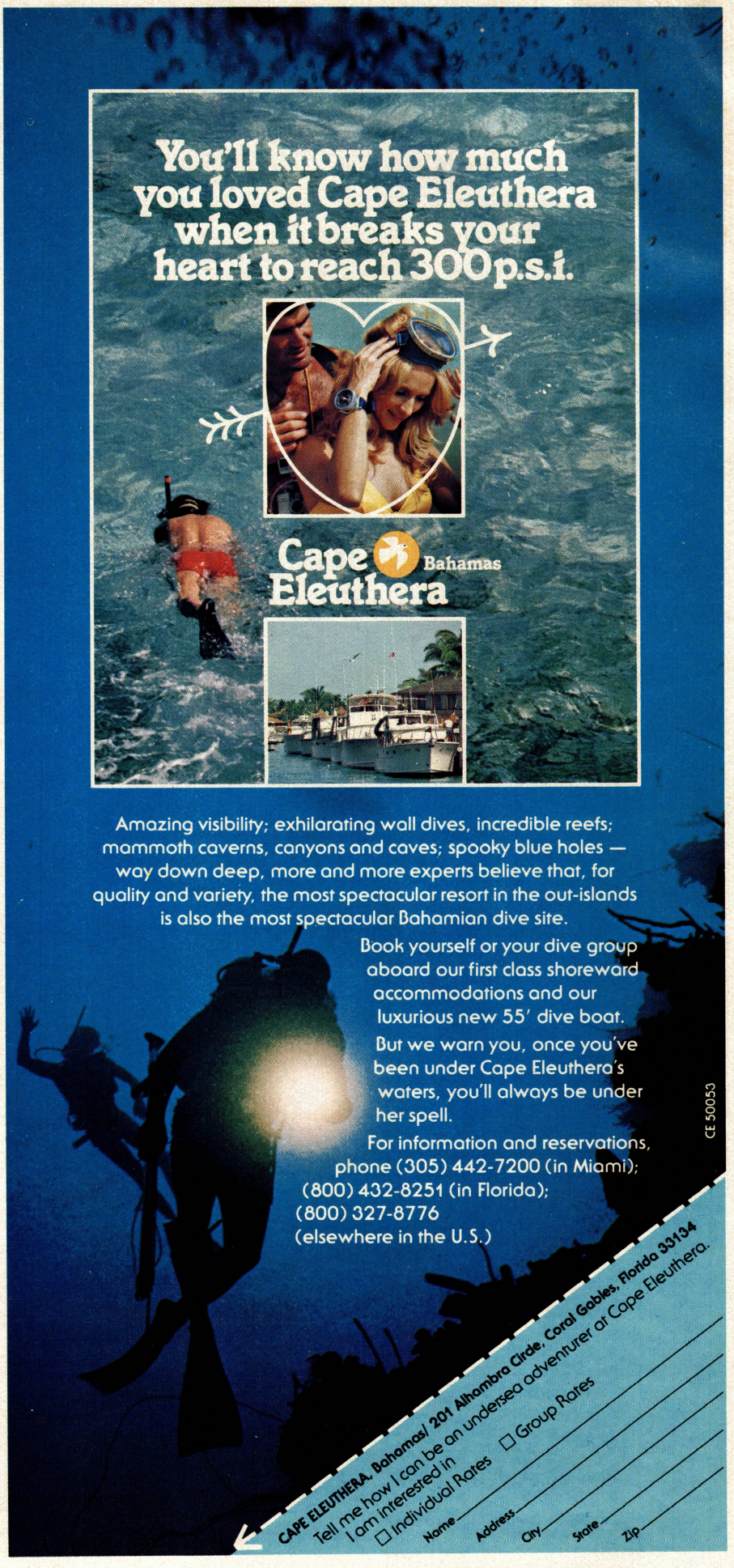
The sites around San Salvador offer an exceptionally wide variety of dive experiences. Because of strict conservation practices there is a large fish population which is extremely friendly and can be hand fed. Approximately 25 different dive sites have been charted along the drop-off on both the west and south end of the island. There are also many beautiful coral caves and large canyons for exploration. A 270 foot steel freighter provides excellent wreck diving opportunities in shallow, clear water. Most of the dive sites are conveniently located 5 to 20 minutes from the San Salvador marina.



The LCM Barge Wreck lies in 70 feet of water off Small Hope Bay Lodge, Andros.

SUMMARY

In the space allowed, we have tried to provide a thumbnail sketch of every dive operation in the Bahamas, but these few words cannot fully do justice to the excitement and friendly atmosphere found on these wonderful islands. The Bahamas can offer a lifetime of dive adventure and exploration to the diver who is willing to seek out their mysteries. Each year these grow larger and better, as new dive sites are discovered and new scuba facilities are opened. If you have never been to the Bahamas, you surely should go. If you've been there before, go again, but perhaps to a new location. You'll not be disappointed, for there you will find an almost infinite variety of islands, people, personalities and dive experiences.



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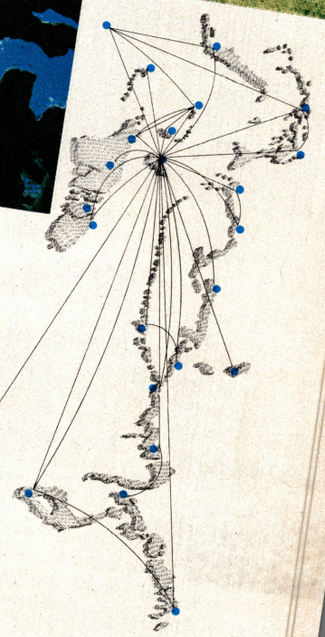

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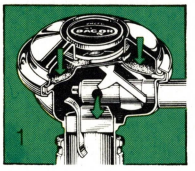
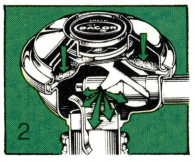
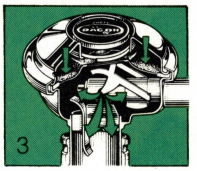


When the breathing cycle is started, the diaphragm is depressed and the second stage valve is opened. As air enters the regulator, it is directed into the mouthpiece (see drawing #1) causing a partial vacuum that holds the second stage valve open.



As the diver continues the inhalation cycle, the second stage lever continues its downward movement (see drawing #2). At this point, as in the beginning of inhalation, the partial vacuum under the diaphragm is holding it down, relieving the diver of doing so with lung power.



At the height of the inhalation cycle, the lever is further depressed (see drawing #3) and at this point the *Venturamatic Flow Vane* comes in contact with the flow of air entering the mouthpiece. This *Flow Vane* is designed to meter the right amount of air entering the mouthpiece while deflecting a certain portion of the incoming air into the regulator which helps to diminish the partial vacuum, and to prevent the unit from free flowing if the diver should take the unit out of his mouth.

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